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A STUDY OF THE EFFECTS OF COMMITMENT AND ANXIETY ON ATTRITION AT THE UNITED STATES AIR FORCE ACADEMY USING A CATASTROPHE MODEL.

THESIS

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A STUDY OF THE EFFECTS OF COMMITMENT AND ANXIETY ON ATTRITION AT THE UNITED STATES AIR FORCE ACADEMY USING A CATASTROPHE MODEL

THESIS

Presented to the Faculty of the School of Engineering

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Operations Research

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Preface

The purpose of this study was to examine attrition at the United States Air Force Academy using the cusp regression model. Primarily, the cusp model was used to model the effects that organizational commitment and trait anxiety had on the Academy's attrition rate. The cusp model shows a significant relationship between anxiety and commitment and attrition.

Further work was conducted using trait curiosity and trait anger in the model of attrition instead of anxiety. The results indicated trait curiosity was a better indicator of attrition than trait anxiety in the cusp regression model. The work with the cusp model and the Academy's attrition data base should continue, in hopes of finding the solution to the Academy's attrition problem, and in expanding the research done on the cusp model.

In preparing this thesis, I received a great deal of help and encouragement. I would like to thank my colleagues at AD/ENY for their support, with a special thanks to Capt Marge Ross, Mr. Luis Diaz, David Heckel, and Daniel McInnis, for their editorial comments, and to Mr. Chris Pfledderer for his help in the use of SAS. I am greatly indebted to Professor Dan Reynolds for his assistance in understanding the cusp regression model, and to Colonel Michael J. O'Connell (Ret) for his patience and support in producing this document. I would like to thank Home Ave

First Church of God for their prayers and understanding, allowing me to take a break from my duties to work on this thesis. I would also thank my 'little brothers', Todd Brunson, Ronnie Bridges, Antonio Johnson, Jerrold Bailey and others, who somehow kept their problems to a minimum so that I could spend more time concentrating on the Thesis and less time on their behavior. Finally, I thank God, because I did not think I could do it; but it's DONE!

Nathaniel Tymes, Jr.

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Abstract

This thesis determined the effects of an individual's trait anxiety and level of organizational commitment on attrition at the United States Air Force Academy. The subjects of this study were entering cadets to the Academy's Class of 1986. The major areas of concern in this study were the applicability of the cusp catastrophe model in modeling behavioral attributes and the usefulness of the trait variables in explaining attrition. The study concluded that the cusp model could be useful in modeling attrition, and that trait curiosity was better than trait anxiety in predicting attrition.

The data base consisted of results from the surveys given to the cadets during their first two years of attendance at the Academy, and of their actual military and academic performance scores. The analysis was accomplished by cusp regression analysis, multiple regression analysis, ANOVA, analysis of the coefficients of determination, and correlational analysis. The results indicated that all of the regression models were significant and that organizational commitment was not a significant parameter in any of the models.

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I. Introduction

This chapter provides the foundation for the study of attrition at the Academy by giving the basic reasoning that prompted the study, the scope of the research, the specific problem addressed, the subsidiary questions explored, and by giving an overview of the text.

Background

For many years, the Office of Institutional Research (OIR) studied different factors related to the retention and performance of the United States Air force Academy cadets. Most of the research dealt with factors in the preadmission process and their relationship to the subsequent cadet turnover. At that time, little attention was given to understanding the process through which well qualified cadets resolved to leave or not to perform at their expected level. The motivation and enthusiasm of the cadets *seems* to decrease over time (Office:1).

In order to explain this situation, the OIR began a systematic study of the cadets as they made their transi-

tion from the family environment (the high school years) to the cadet environment of the Academy. For over a year, the OIR collected data on the class that entered the Academy in 1982. The data base has been analyzed by several individuals including an AFIT Thesis effort entitled " A Study of the Effects of Locus of Control and Commitment on Retention at the United States Air Force Academy " (Beatty,1985). That study and others assess the problem of attrition at the Academy as a function of the interaction of different factors which may change over time.

So far these studies have not produced any major advances in the understanding of the problem. Therefore, a new way is proposed to model cadet attrition. The new model uses the insights of catastrophe theory which seeks to explain abrupt changes in a system's behavior. The cusp catastrophe model proposed by catastrophe theory explains how a small change in the combination of factors (independent variables) can lead to abrupt changes in behavior, in this study attrition. This model previously has been used to understand how job tension and commitment are related to voluntary termination by nursing employees (Sheridan and Abelson,1983).

Scope

In this study, only a small portion of the data collected on the class of 1986 will be analyzed to help understand possible influences on withdrawal from the Academy.

The OIR research plan called for using standard survey instruments to obtain data instead of developing new and academy specific instruments. This decision allows the researcher to analyze attrition using instruments whose validity and reliability have already been proven. The OIR consulted experts outside of the Academy and at the Academy to develop the surveying procedures, and to analyze the raw data. Finally, the OIR decided to use the Academy standard performance measures, grade point average and military performance average, instead of developing new measures (Office:1-2).

To limit the scope of this research, this study does not attempt to derive new statistical methods or use more complicated models of catastrophe theory. This study also limits the number of independent variable to two, anxiety and commitment.

Research Question

Because of the high attrition rates in many previous classes, the Office of Institutional Research sought to determine some of the factors that influence the Academy cadets' withdrawal decision. Once the factors are understood, the Academy can move either to better screen perspective candidates, or to change the environment so that these qualified students will remain at the Academy. Any realistic solution to the problem should be cost effective for the Academy, since it will increase the number of

officers that graduate and reduce the average cost of graduating cadets.

Specific Problem

This study examines the effects of an individual's trait anxiety, that is, the cadets ability to perceive things in the environment as ego threatening, and the cadet's organizational commitment on the cadet's decisions to stay or leave the academy.

Subsidiary Questions

(1) Does the cusp model better explain the effects of trait anxiety and organizational commitment on attrition?

(2) What is the relationship between trait anxiety, curiosity, and anger and how do they affect attrition?

(3) Which performance measure gives a better indication of attrition?

(4) In what ways do the results from the cusp model differ from those obtained in traditional regression analysis.

(5) Which independent variables commitment and anxiety (or curiosity or anger) gives a better relationship to attrition.

Overview of the Thesis

Chapter Two provides the literature review on catastrophe theory, the cusp catastrophe model and development of the regression form of the model, a discussion of trait

anxiety and its underlying theory, and an explanation of organization commitment and it's relationship to turnover. Chapter Three discusses the methodology used in the research, including the data base, the data collection procedures, an explanation of the instruments used, and the specific cusp regression model and the linear regression model. Chapter Four presents the results of the analysis. Chapter Five discusses the study's final conclusion. Chapter Six provides suggestions and recommendations generated from this study.

II. Theory and Literature Review

In this chapter, the variables that will be examined in this study are explained so that one can understand what factors influenced the choice of the variables. The theory behind the cusp catastrophe model is presented. This allows one to follow the development of the model used in chapter three from its original form to the development of its linear regression form. After the model's development, there will be a survey of the literature that has used the catastrophe model to examine employees' withdrawal behavior. Secondly, there will be a presentation of Spielberger's theory dealing with anxiety and its appropriate literature survey. Finally, there is a discussion of Mowdays et al. research on organizational commitment.

Catastrophe Theory

Catastrophe theory seeks to explain in mathematical terms how a small change in a personal or environmental factor can produce an abrupt change in behavior. Prior to catastrophe theory, the primary way of building mathematical models of natural phenomena employed the use of differential equations. Differential equations could be used to explain phenomena where change was smooth and continuous (functions had to be differentiable); however, many phenomena in the world are sudden transformations and unpredictable divergences which cannot be analyzed by differen-

tial equation models (Zeeman,1976:65).

Background.

In 1972, Rene Thom in "Structural Stability and Morphogenesis," according to Zeeman (1976), introduced the concepts of catastrophe theory and developed mathematical theorems to explain different discontinuous natural phenomena. Using both geometry and topology, Thom lays the groundwork for the revolutionary way of conceptualizing different natural forms. The reason the theory is developed from topology is because the underlying forces in nature behind these phenomena can be described as smooth surfaces in equilibrium. It is when this equilibrium breaks down that a catastrophe occurs. The catastrophe results when gradual changes in forces or motivation results in abrupt changes in behavior (Zeeman,1976:65).

Thom wrote that there are only seven elementary catastrophes that exist in nature. Table I gives Thom's list of the elementary catastrophes and their equations. This study uses only the cusp catastrophe model, whose name derived from the fact that the discontinuity form a pleat or fold in the behavior surface which when projected on to the control plane forms a cusp. Figure 1 illustrates the cusp model. The cusp model is shown as a three dimensional model where the intersection of the axis of the independent variables represents the control surface, and the response generated along the third axis is known as the behavior

Table I
The Equations for Thom's Seven Catastrophes
(Zeeman, 1976:78)

	CATASTROPHE	CONTROL DIMENSIONS	BEHAVIOR DIMENSIONS	FUNCTION	FIRST DERIVATIVE
CUSPOIDS	FOLD	1	1	$\frac{1}{3}x^3 - ax$	$x^2 - a$
	CUSP	2	1	$\frac{1}{4}x^4 - ax - \frac{1}{2}bx^2$	$x^3 - a - bx$
	SWALLOWTAIL	3	1	$\frac{1}{5}x^5 - ax - \frac{1}{2}bx^2 - \frac{1}{3}cx^3$	$x^4 - a - bx - cx^2$
	BUTTERFLY	4	1	$\frac{1}{6}x^6 - ax - \frac{1}{2}bx^2 - \frac{1}{3}cx^3 - \frac{1}{4}dx^4$	$x^5 - a - bx - cx^2 - dx^3$
UMBILICS	HYPERBOLIC	3	2	$x^3 + y^3 + ax + by + cxy$	$3x^2 + a + cy$ $3y^2 + b + cx$
	ELLIPTIC	3	2	$x^3 - xy^2 + ax + by + cx^2 + cy^2$	$3x^2 - y^2 + a + 2cx$ $-2xy + b + 2cy$
	PARABOLIC	4	2	$x^2y + y^4 + ax + by + cx^2 + dy^2$	$2xy + a + 2cx$ $x^2 + 4y^3 + b + 2dy$

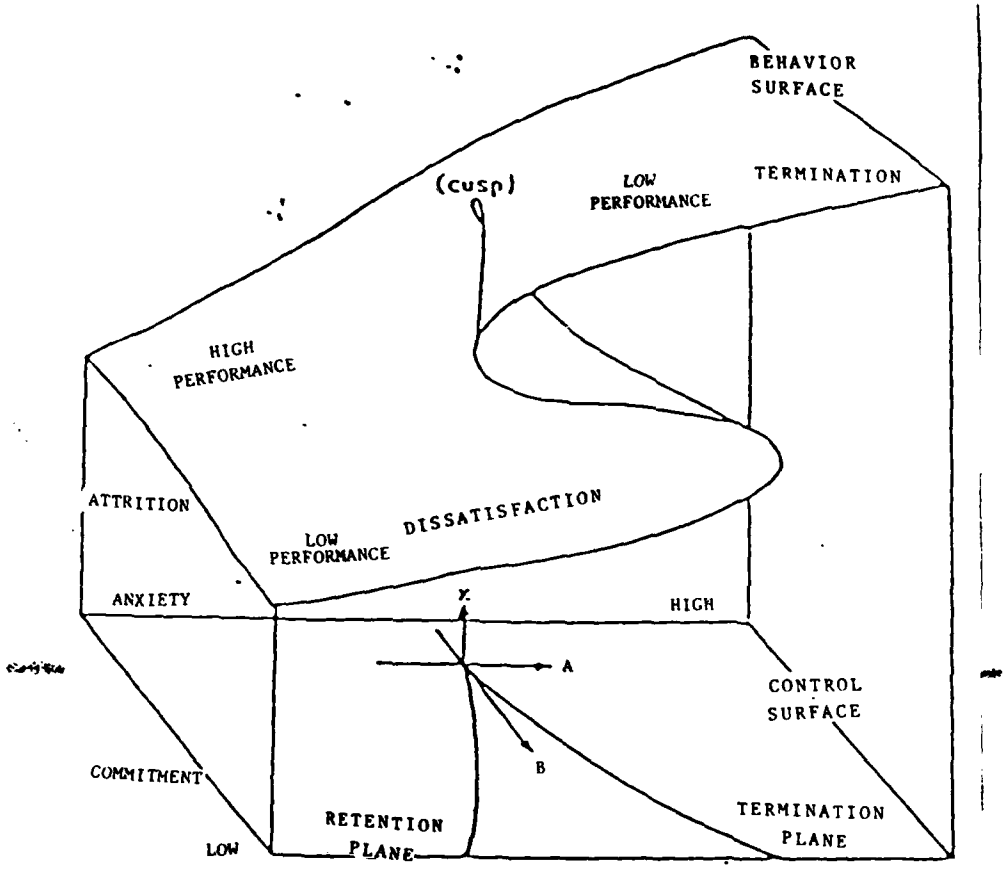

Figure 1. A Diagram of the Cusp Model (adapted from Cobb, 1981b:65). L is assumed constant.

surface. The set of points that are contained within the projection of the pleat on the control plane, the cusp, forms the bifurcation set. The bifurcation set defines the threshold where sudden change may happen. When a person can be described as being outside the cusp, there are smooth and continuous variations in the person's behavior along the control parameters. However, when a person passes all the way through the cusp a catastrophic change in behavior results. When the point is located inside of the bifurcation set either mode of behavior is possible. The middle sheet of the fold curve is inaccessible, therefore as the fold curve is crossed, the points jumps between the upper and lower surface (Zeeman,1976:68).

Cusp Catastrophe Model.

The cusp catastrophe model is one of the elementary forms proposed by Thom to explain natural phenomena. There are several features of the the cusp model: (1) over part of the range the behavior is bimodal; (2) the bimodal behavior occurs inside of the cusp; (3) going from one behavior surface to the other, a sudden change is observed; (4) the effect of hysteresis, that is the transition from the first mode to the second does not take place at the same place as the transition from the second mode to the first; (5) "a small perturbation in the initial state of the system can result in a large difference in its final states", in other words there exist the possibility of

divergence. If any of the five qualities are present, then look for another, and if more than one is formed, then the process is a candidate for the cusp model (Zeeman,1976:76). Figure 2 shows the properties of the cusp catastrophe model.

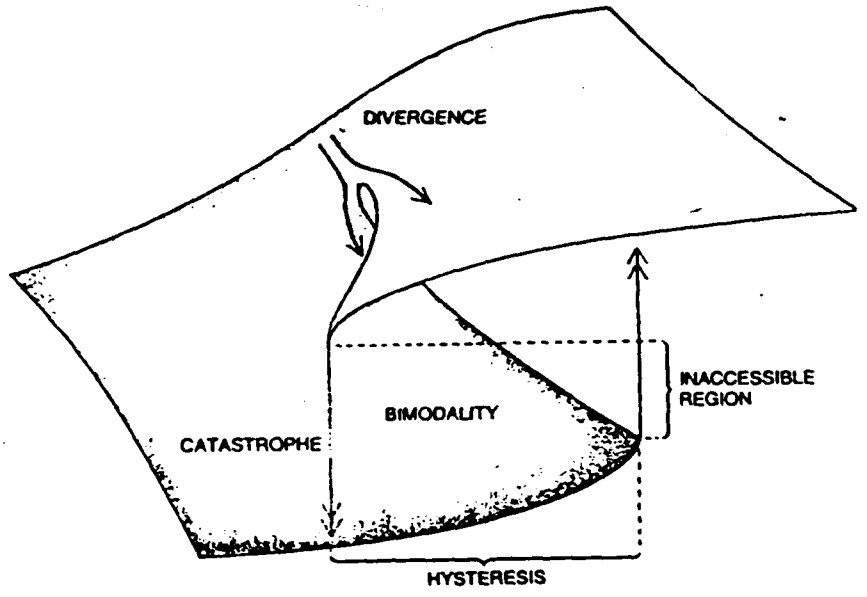

Figure 2. The Five Properties of the Cusp Model (Zeeman,1976:70)

The cusp catastrophe model allows for two control factors in this research, anxiety and organization commitment, which are postulated to cause specific behavior, and one behavior factor (attrition). In comparison to other statistical models, the control variables of the catastrophe model correspond to the independent variables, and the

behavior response variable correspond to the dependent variable (Cobb,1981:75). The control factors can also be labeled splitting factor and normal factor or conflicting factors if neither is a splitting factor (Zeeman,1977:332). The factor is called normal because at low levels of the other control factor the change in this control factor results in smooth changes in the behavior factor. The normal factor is also known as the asymmetry factor because as this factor changes in relation to increases in value of the other control factor the symmetry of the distribution changes within the expected range of behaviors. The normal factor serves as an attraction for the subjects, creating a greater desire to remain in the environment. On the other hand, the second control factor is called the bifurcation or splitting factor because an increase in this factor will produce a split in the otherwise unimodal distribution of the normal factor creating a bimodal distribution. At higher levels, the splitting factor causes the subjects to want to leave the environment. The greater the splitting factor in the environment the more a person become dissatisfied with the environment, and the greater the decline in performance leading to attrition (Steward and Peregoy,1983:347).

Cusp Regression Model.

In order to use catastrophe theory for analysis in the social sciences a cusp regression model was developed.

Referring to Table 1, the equation for the deterministic cusp model is:

$$f(X) = 1/4\ X^4 - AX - 1/2\ BX^2 \qquad (1)$$

The solution to it's first derivative equation gives the critical points which are used to draw the cusp surface above the control plane (Zeeman,1976:78). Cobb notes that a drawbacks with using the cusp model as a statistical model, is incorporating an error term to account for random variability. To overcome this limitation, Cobb uses the method of stochastic differential equations to develop a cusp catastrophe model. So Cobb derived a cusp probability density function which incorporates the deterministic formula from (1) above:

$$f(X) = k\exp\{[A(X-L) + 1/2B(X-L)^2 - 1/4(X-L)^4]/d\} \qquad (2)$$

where k is a constant that normalizes (2) such that $\int f(x)dx = 1$ (Cobb,1981a:44,61; Cobb,1981b:76; Cobb,1978:363). The Cardan discriminant, $D = 27A^2 - 4B^3$, distinquishes how many real roots to expect. If $D>0$ then there is one real root; if $D<0$ then there are three real roots, and the middle root is the unstable equilibrium point; and if $D=0$, then there are three real roots, two of which have the same value (Guastello,1982a:264-265; Cobb,1981:76). The determinant can be used to determine the number of cases that fall within the cusp region. If $D<0$ then the point lies in

the bimodal region or within the bifurcation set; however if D>0 then the point lies in one of the unimodal areas; and if D=0 then the point is the catastrophe point and the values of A and B will determine the nature of that point. If A=0 and B=0 then the point is the cusp catastrophe point otherwise it is a fold point (Guastello,1982b:137; Cobb,1981a:76). The Cardan determinant allows one to heuristically interpret the four parameters in the cusp model. The following is the list of parameters in equation (2) for the cusp catastrophe model (see figure 1).

1) Asymmetry (A)- If D<0 then the cusp density is bimodal and A determines the relative height of the two modes. If D>=0 then the cusp density function is unimodal and A measures skewness.

2) Bifurcation (B)- If D<0 ther B determines the separation of the two modes, while if D>=0 then B measures kurtosis.

3) Location (L)- The cusp catastrophe point is located at x=L with A=0 and B=0. Changing the value of L translates the cusp density model on the x-axis without changing its shape.

4) Dispersion (d)- This parameter determines the amount of variation about the two modes of a bimodal cusp density in the same way that the variance determines the variation about the mode of a normal density. It is not a scale parameter (Cobb 1981b:61).

It can be shown that Stephen Guastello (1982a) expands equation (2) as a linear regresssion model and introduces empirical weights. The basic equation that Guastello develops:

$$\Delta z = z_2 - z_1 = b_0 + b_1 z_1^3 + b_2 B z_1^2 + b_3 A \qquad (3)$$

where z is normalized by

$$z_i = (x_i - L_i)/sigma_x \quad i = 1,2 \ldots n \qquad (4)$$

and L_i is the lower limit of x_i which can be set to zero in certain cases, n is the sample size, and all other parameters are same as in equation (2). The Cobb equation represents the principle of ultimate covariance, that is, it assumes that each case or subject is a unique population of one with its own distribution parameter. To account for fold degeneracy, skewness, retardation and restriction of range, several other terms were added by Guastello so that the final model is,

$$\Delta z = b_0 + b_1 z_1^3 + b_2 z_1^2 + b_3 B z_1 + b_4 A + b_5 B \qquad (5)$$

where $b_2 z_1$ accounts for fold degeneracy and $b_5 B$ corrects the skewness (Guastello,1982a:260-262).

Survey of the Literature.

Several researchers have applied catastrophe theory, particularly the cusp model, to behavioral science prob-

lems. Stephen Guastello (1982b) examined the difference in color matching performance between day shift and night shift workers employed at a midwestern printing firm. Guastello investigated the effects of job length and the accounting period, which controls for the organizational changes that occurred over the period of the investigation, on color-matching proficiency. The proficiency variables were color-match time, printing press time, and paper consumed. Using the cusp model, he found that the model explained 99 percent of the variance in the time to match colors; 98 percent of the variance for the consumption of paper; and only 37 percent of the press time variance.

In another study, Guastello (1982a) demonstrated the continuity between the cusp model and the conventional regression model. For 272 salespersons from a midwestern firm, he examined the effects of group membership, a personality composite and ability test scores on performance. He concluded that the cusp catastrophe model was significantly better in predicting performance than the conventional regression analysis. And finally, Guastello (1984) examined the catastrophic changes in group absentee rates as a function of change in an organization's policy regarding absenteeism. The subjects were 19 groups of employees from a midwest manufacturing firm. He examined the effects of group size, organizational subdivision, and average age of department members and found that changes in absentee rate did fit the cusp model.

Another study using the cusp model was conducted by John Sheridan and Michael Abelson (1983), which examined the effects of job tension and organizational commitment on the process leading to job termination. They examined the data collected from 346 nurses and concluded that the cusp model had several important implication for the prediction and description of the withdrawal process. In another study, Sheridan (1985) used the cusp model to examine the effects of job tension and group cohesion on the withdrawal process of female nursing employees. Sheridan found that the cusp model was more accurate in explaining withdrawal behavior than the traditional linear regression model.

State-Trait Anxiety Theory

Many different theories of anxiety have been developed by clinical psychologists, psychiatrists, and counselors. Each theory deals with the different components that are elicited when a person is in an anxious state. This study will deal State-Trait Anxiety Theory. Anxiety is defined as a "palpable but transitory emotional state or condition characterized by feelings of tension and apprehension and heightened autonomic nervous system activity" (Spielberger,1972:24). The symptoms of anxiety, familiar to most, include an increased pulse rate and heart beat. In order to better understand anxiety, a distinction should be drawn between anxiety and stress. Anxiety differs from stress because stress is a response to an actual threatening event

whereas anxiety is the result of interpreting an event as threatening whether it is or not. In a stressful situation there is the actual presence of a threat and the perception of a stimulus as physically or psychologically dangerous; whereas, in the anxiety situation, the individual interprets the situation as personally threatening (Spielberger,1972:30).

Another prerequisite to understanding State-Trait Anxiety is to understand the difference between a personality state and a personality trait. Personality states are transitory conditions that occur when a situation elicits it and endures as long as the stimulus (situation) is present. Personality states "refer to palpable empirical reactions or processes taking place here and now at a given intensity level" (Spielberger,1972:32). The state will last only as long as the condition lasts. On the other hand, a personality trait is the enduring characteristic of an individual to perceive the world in a certain way and to react or behave in a specific manner with regularity. Personality traits "represent latent dispositions to respond with certain types of reactions if triggered by appropriate stimulus" (Spielberger,1972:31,32). A personality trait is a characteristic of the individual to respond in a specific particular manner to the circumstances that confront him.

According to Spielberger, state anxiety (A-State) "may

be conceptualized as a transitory emotional state or condition of the human organism that varies in intensity and fluctuates over time' (Spielberger,1972:39). A-State refers to the emotional reactions evoked in an individual because of personally threatening situations and is characterized by feelings of tension and apprehension and by heightened autonomic nervous system activity (Spielberger,1972:30,31). However, 'trait anxiety (A-Trait) refers to relatively stable individual differences in anxiety proneness, that is, to differences in persons' pre-dispositions to perceive a wide range of stimulus situations as dangerous or threatening, and in the tendency to respond to such threats with A-State reactions' (Spielberger,1972:39).

State-Trait Anxiety theory assumes that the arousal of anxiety is precipitated by a process or sequence of ordered events that are perceived as either externally or internally dangerous or threatening (Spielberger,1974:42). Appraisal of a situation as threatening is influenced by a person's aptitude, abilities, and past experiences as well as by his trait anxiety level and the objective danger (Spielberger,1974:43).

When the individual interprets an event as threatening there is an increase in the activity of the autonomic nervous system signaling an increase in A-State anxiety reaction, the intensity of the reaction will be proportional to the amount of threat the situation poses, and the duration depends on the persistence of the provocative

event and the individual's past experiences. If the individual frequently encounters stressful situations then he will developed effective coping behaviors to reduce the stress or alleviate the danger. Additionally, the individual might develop defense mechanisms that will reduce the intensity of the A-State (Spielberger,1972:43). In situations that are perceived to be threatening A-State is high, whereas in nonstressful situations or where the danger is not perceived the A-State is low. When the individual interprets a large number of events as dangerous or threatening and respond with a greater intensity of A-State reactions, ie increased heart rate, than low A-State individuals then the person possesses a high trait anxiety characteristic (Spielberger,1972:39). Investigations have produced results that demonstrate that fear of failure is a major characteristic of high A-Trait people, and that ego-involving instructions are more detrimental to their performance. High A-Trait persons are highly sensitive to ego-threatening situations or at least situations they perceive as ego threatening (Spielberger,1972:40).

Survey of the Literature on State-Trait Anxiety.

The State-Trait Anxiety Inventory has been used in several research studies. Douglas S. Payne (1983) used the instrument with 287 college undergraduates in order to study the role of individual differences in trait anxiety in the relationship between naturally occurring stressors

and the state anxiety score' (Payne,1983:300). He studied the relationship of life stress and state anxiety for each level of trait anxiety. The study was conducted to confirm the hypothesis that 'trait anxiety moderates one's susceptibility to stressors producing more intense and more frequent anxiety states' (Payne,1983:302). Payne's research did not confirm that high anxiety trait individual would show a higher correlation between state anxiety and life stress than low A-Trait individuals. He found a significantly strong correlation between state anxiety-and trait anxiety ($r = .65$, $p < .0001$) whereas the correlation between trait anxiety and life stress ($r = .27$, $p < .0001$) and the correlation between state anxiety and life stress ($r = .19$, $p < .0013$) were significant but relatively weak. He interprets his findings as indicating that high A-Trait individuals act in ways that create higher levels of life stress (Payne,1983:305).

Furthermore, Schneider and Schneider (1984) examined 120 volunteers performing verbal discrimination learning tasks. The independent variables in their experiment were feedback (positive, negative, or both), trait anxiety (high or low) and sex (male or female). The subjects were ask to perform twelve trials with the dependent variable being the number of errors committed per trial. They found that the interactions between feedback, anxiety, and trials were significant. Additionally, they found that the different

feedback contingencies did not produce significantly different performances for the highly anxious group. However, the individuals in the low anxiety, negative feedback group showed a decrease in performance in the middle trials. The researchers concluded that negative feedback only affects low trait anxiety individuals in a debilitating way. Even though both groups experienced increases in A-State, it is low A-Trait individuals whose anxiety interferes with performance.

Another study using anxiety as one its factors was conducted by Zarantonello et al. (1984), which examined the effects of anxiety and depression on anagram performance, and the ratings of cognitive performance. The researchers administered the Beck Depression Inventory (BDI) and the State - Trait Anxiety Inventory (STAI) to 400 undergraduates. Based on their STAI/BDI scores 72 subjects (36 males and 36 females) were selected. They were placed into three groups of 24 members each based on their scores on the tests: depressed, anxious, and the control groups. Since the raw A-Trait scores of the depressed group almost approximated that of the anxious group they were labeled the depress-anxious group. The depressed-anxious group tended to be slower at unscrambling anagrams, reported that they spent more time worrying about their performance, and gave themselves a more negative subjective rating than the control group. Similarly, the anxious group reported the same effects as the depressed-anxious group. There was no sig-

nificant difference between the anxious and the depressed-anxious groups. The authors concluded that the reduced efficiency in performance and the negative subjective evaluations accounted for the significant effects of the anxiety factor on both groups (Zarantonello,1984:24).

Finally, Spielberger and Barker (1979) studied attrition for the United States Navy, by examining the effects of anxiety, curiosity and anger, on performance of Navy and Air Force recruits. They conducted three studies to determine the extent to which individual differences in anxiety, curiosity and anger are related to recruits' not completing basic training or encountering disciplinary problems. In the first study, the authors examined the relationship between 203 Navy trainees' performance and anxiety and curiosity scores. In this initial study, the researchers found that trait curiosity was the only variable with a significant statistical difference among their three groups: the Disciplinary Problem group, the Academic Problem group and the No Problem group. The authors concluded that, based on the pilot study, the test instruments were appropriate for use with military personnel. They also found that those individuals classified as Disciplinary Problems were both smarter and more curious than the other groups. The Academic Problem group exhibited more anxiety than the other groups (Spielberger and Barker,1979:12,15).

The researchers conducted another study with 263 Navy

recruits examining the extent to which academic performance, disciplinary problems, and attrition could be predicted by measures of curiosity, anger and anxiety. They divided the group into five subgroups: Unsuitable Discharges, Setbacks, Academic Problems, Disciplinary Problems and No Problems. For the 192 males, the researchers found that the Discharged groups scored much higher in state anger and anxiety than any other group. The Setback group scored the lowest in state anger. The Academic Problem group scored higher on trait anxiety and on trait and state anger and lower on trait curiosity than the No Problem group. For the 71 females there were no significant difference among the groups. The study concluded that only measures of anxiety were related to attrition and to performance problems of the recruits (Spielberger and Barker 1979:28).

Spielberger and Barker conducted a similar experiment with 1702 Air Force recruits. They divided the group into three categories: Graduates, Setbacks, and Discharges and found that the Discharges group had the highest state and trait anxiety score. The Setback group had a significantly higher score than the Graduates on the trait anxiety inventory.

The authors concluded from the three studies that the personality measures could be useful in identifying recruits who would have problems completing their training due to debilitating emotional traumas. They also concluded

that the first few days of training are the most stressful but most of recruits quickly adapt to their new environment. The study also showed that recruits that are high in anger and anxiety have a harder time adjusting to military life, and that this trait can be predicted early in the training (Spielberger and Barker, 1979:34-35).

Organizational Commitment

The final section of this chapter deals with organizational commitment. Organizational commitment can be defined as the process by which a person identifies with and becomes involved in the organization. The characteristics that indicate an individual's organizational commitment: a) strongly believing in and accepting the goals of the organization; b) being willing to put forth considerable effort on behalf of the organization; and c) a very strong desire to remain a part of the organization (Mowday, Porter, and Steers,1982:27). Organizational commitment does not imply passive loyalty to the organization but involves an active relationship where the individual makes sacrifices for the greater good of the organization. However, the relationship is a mutual one where the individual needs and desires are satisfied and his/her skills are effectively utilized in the work environment of the organization. If this satisfaction of the individual's expectations does not exist, then commitment decreases (Mowday, Porter, and Steers,1982:27).

There are several factors that influence organizational commitment. One factor concerns the personal characteristic of the individual, such as age tenure, educational level, gender and various personality traits. The age of an individual can have a great influence on whether a person remains with an organization due to the fact that older people are more limited in chances for other employment. Tenure is also positive correlated to organizational commitment, the longer a person has been with an organization the less likely the individual is to leave. However, educational level can be negatively correlated with commitment since the higher the educational level the more the individual expects from the organization, and if expectations are not met then commitment decreases (Mowday, Porter, and Steers,1982:30,31).

A second factor influencing commitment is the individual's role within the organization. The role related attributes are job scope, role conflict, and role ambiguity. If the scope of the job increases providing the employee with new and innovative challenges then there is a corresponding increase in commitment. However, if there is an increase in role conflict then there is a decrease in commitment. Studies conducted on role ambiguity produced mixed results and found that as long as the employees had clear and challenging tasks commitment increased, but when their roles produced extreme stress, conflict or were am-

biguous then commitment decreased (Mowday, Porter, and Steers,1982:31-32).

The third factor related to commitment was the organizational structure. Individuals who experience greater decentralization of authority, whose work depended on the work of others, and those who worked in an organization which had more formal written rules and procedures were more committed. Yet, it was found that factors such as size of the organization and the presence of an union had no significant effect on commitment (Mowday, Porter, Steers,1982:32-34).

The final factor that was hypothesized as influencing commitment is the experiences of the individual with the organizational's work environment. Variables such as organizational dependability, the individual feelings that he is important to the organization, the positive attitudes of the co-workers, the perceptions of pay equity, and degree of involvement were positively correlated with commitment (Mowday, Porter, and Steers,1982:34-35).

Commitment is both attitudinal and behavioral. The relationship between behavior and attitudes are reciprocal, that is, commitment attitudes will precede behaviors that strengthen the attitudes, and commitment behaviors precede attitudes and continued behaviors. The commitment process involves this self-reinforcing cyclic interplay between attitudes and behaviors that evolves over time because of the job environment (Mowday, Porter, and Steers,1982:47).

Survey of Commitment Literature.

Mowday, Porter, and Dublin (1974) surveyed 411 female clerical worker of a California bank to determine the relationship between the performance of the employees and their attitudes about the work unit and the organization. The subjects were administered three surveys: organizational commitment instrument, sources of organizational commitment attachment, and the Job Descriptive Index. Mowday et al found that in organizations with high performance ratings that the employees possessed high levels of commitment both to the larger organization and to the branch in which they worked.

In another study, Werbel and Gould (1984) surveyed 209 registered nurses in order to determine the relationship between organizational commitment and turnover. They used the employees tenure with the organization to partition the group. Those individuals with less than a year of employment with the organization was considered recent hires while those with more than a year were considered tenured employees. The researchers concluded that there was not a significant relationship found between commitment and turnover in recent hires; however, with the tenured employees an inverse relationship was found. Werbel and Gould interpreted their results as indicating that the organizational commitment in the initial period reflects unrealistic job expectations and the justification for choosing that job in

the first place. Therefore the organizational commitment of recent hires are unstable.

Porter, Steers, and Mowday (1974) investigated the effects of organizational commitment and job satisfaction on the turnover rate of 60 psychiatric trainees. The experimenters found that the attitudes that the individual has about the organization (as opposed to his attitudes about his specific job) can be used to predict turnover. However, the strongest relationship between attitudes and turnover shows up when the employee is close to-leaving the organization. Furthermore, in this study organizational commitment was shown to be better at differentiating between stayers and leavers than was job satisfaction (Porter, Steers, and Mowday,1974:603).

Focus of this Research

Several important concepts have been presented that pertain to this study. One important concept concerns the applicability of the cusp catastrophe model to the the present study. Based on the research presented in this chapter it is reasonable to assume that the cusp catastrophe can be used to model withdrawal behavior since several experimenters have used the model in exploring the job termination process and concluded that the cusp model could account for significantly more of the variability in the data than the linear regression model. It is evident that the cusp model is appropriate for the analysis of

withdrawal from the Air Force Academy as an abrupt behavioral decision made by previously highly motivated cadets.

In order to apply the cusp model, there must be two control variables and a behavior measure. Since the cusp model called for an asymmetry factor which would motivate the cadet to stay at the academy, organizational commitment was chosen to be that factor. Organizational commitment is the measure of the individual's willingness to sacrifice for the good of the organization. The relationship that develops between the individual and the organization is a reciprocal one. The organization must meet the needs and the desires of the individual while providing a challenging work or training environment. If the organization provides for the individual, then the cadet should develop a sense of loyalty to the organization. A significant part of this relationship is the attitudes of other members of the organization, which will affect the newcomers attitudes.

The splitting factor, defined as the factor in the cadet's environment which motivates the cadet to consider leaving the academy, used in this study is trait anxiety. Trait anxiety is the propensity of an individual to interpret events as ego-threatening. The higher the trait anxiety of the individual the greater the number of events that will be interpreted as ego-threatening. Hence the more the individual will seek to lessen the number of anxiety provoking events. Spielberger and Barker conducted

research on Air Force and Navy recruits and concluded that anxiety was related to both attrition and behavioral problems.

The performance variable, or behavioral variable for this study will be grade point average (GPA) in the first model and the military performance average (MPA) in second model. The GPA and MPA will be from the same semester and will be that semester's grade and not the cumulative grades. The dependent variable will be attrition. It is posed that as the cadet approaches the decision to leave, his performance declines (Sheridan and Abelson,1983). Figure 3 gives a diagram of the proposed model used in this study and the relationship of the variables.

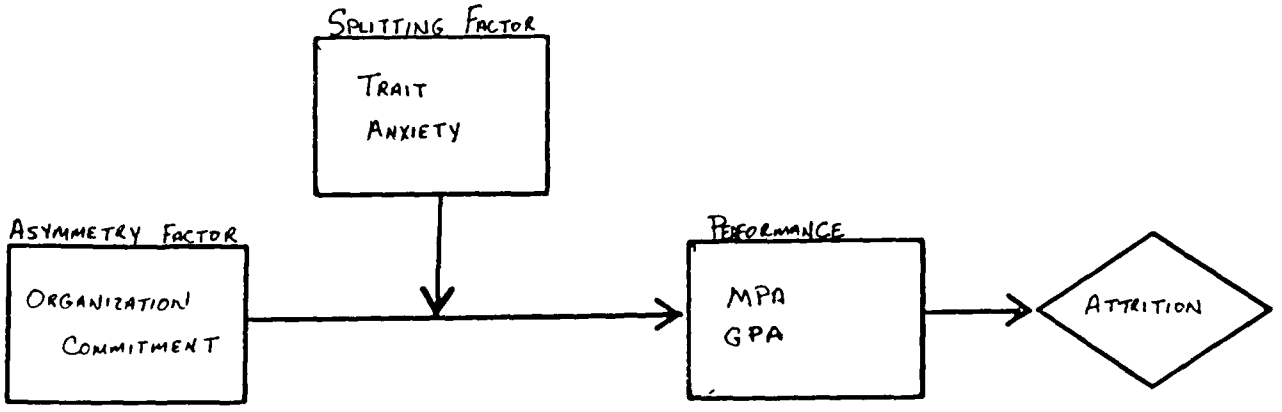

Figure 3. Diagram of the relationship between the variables of the model.

Chapter Three presents the methodology behind the study. It will discusses the data base, the data collecting procedures, and the actual models used in the study.

III. Methodology

Introduction

This chapter documents the methodology employed in the study. It will explain the data base used, the background of the subjects, the data collection procedures, the survey instruments used and the measures employed in the data analysis.

Data Collection and Data Base

The data was collected from surveys given to the Cadets in July of 1982 while they were in the middle of Basic Cadet Training during their first summer at the Academy. The questions for the Organizational Commitment Questionnaire (Appendix A) were administered as part of the Basic Cadet Attitude Survey, and the State-Trait Personality Inventory (Appendix B) was administered as part of the Self Assessment Questionnaire. Appendix C contains the listing of the contents of the research file compiled by the Office of Institutional Research; there is also included in the appendix a listing of the surveys specifically addressed in this study. Appendix D contains the listing of the Air Force Academy's attrition codes. These codes were used to identify the circumstances surrounding the cadets' departure from the Academy.

Subjects

The subjects for this study were 1494 cadets in the

Class of 1986 who entered the United States Air Force Academy in the Summer of 1982 for six weeks of Basic Cadet Training (BCT). All of the cadets were high school graduates with a small percentage having prep school or prior college experience. Basic Cadet Training, with its emphasis on military and physical training served as their initial introduction to the Academy. Once the cadets had satisfactorily completed BCT, they began four years of academic instructions, physical and military training and development.

During the course of the Academy program 544, or 36%, of the 149. cadets left the Academy, 479 or 32% were due to circumstances that could be interpreted as voluntary. Table II gives a list of the codes which are considered in this study as voluntary reasons for attrition from the Academy. That is, those individual's record which possess the codes in Table II will be considered as withdrawing from the Academy before graduation. Of the group of 479 cadets leaving the Academy, 24% had insufficient desire to complete the program, 20% were academic discharges, 13% changed their career interest while at the Academy, and 9% could not cope with the military training at the Academy. There were various reasons given for the other 34% which are recorded in Table II with their numerical breakdown.

Table II
Reasons for Attrition (adapted from Beatty, 1985:23)

CODE	NUMBER WITHDREW	REASON
2Q	117	Insufficient Desire to Complete
1C	96	Academic Discharge
2S	61	Change Career Interest
4G	42	Inability to Cope with Military Training Program
3	32*	Resign for Honor Violations
2H	20	Too Much Regimentation/Not Enough Freedom
2C	18	Academic Pressure
4T	13	Parental Pressure
2G	12	Unwilling to Make Group Adjustment
4A	9	Personal Reasons
2T	6	Change in Physical Condition
6L	6	Suspended
6A	6	Departed Pending Turnback
4V,U	6	Resign in Lieu of Board Action
2R	6	Always Desires Another Career
2A	4	Insufficient Choice of Classes
4E	4	Personal Hardship
1E,B,Z	4	Discharge for Aptitude, Conduct, Academic Reasons
4C	4	Personal (to be Married)
4Q	2	Lack of Military Aptitude
Other	13	

Total Number of Cadets Leaving: 479

* includes several categories of honor code violations

In order to obtain a valid sample population, the original data base of 1494 records was reduced to 340. Due to some errors in recording the data, the records with data that was not in the specified range were deleted. This did not lead to a significant reduction in the data base. The next phase of the reduction occurred to limit the analysis to those cadets who had taken both the Organization Commit-

ment Questionnaire and the State-Trait Personality Inventory in July 1982. Once these two screens were applied to the data base the sample population had been reduced from 1494 to 340 subjects. Of these 340 individuals 42 or 12% withdrew from the Academy prior to graduation. The reason for the low percentage of attrition in the sample when compared to the population was because of the performance variable. One of the screens used to filter the data, was the grade point average or military performance average from the spring semester of 1983. Those cadets who withdrew from the Academy before that spring semester were not counted in the sample size.

Procedure

Data Collection. The Office of Institutional Research plan was designed to collect both attitudinal and behavioral data during the first year of the cadet's enrollment at the Academy. The records kept on each member of the class of 1986 includes the behavioral and attitudinal data along with evaluations of military and academic performance, attrition codes and demographic data.

The Office of Institutional Research used two sources for data collection: (1) the cadets' actual performance and retention and (2) behavioral and attitudinal assessment surveys that the cadets completed. The cadets began receiving the questionnaires on 4 June 1982 prior to entering the Academy. A total of 704 surveys were mailed on that

date to prospective cadets who had accepted their appointment. The 553 responses to the survey were entered into the data base as the pre-admission phase. The post-admission phase consisted of the data collected in the surveys given from 30 June thru 5 July 1982, the one given 8 and 11 August 1982, November 1982, April 1983, and the final survey given in August 1983. Tables III and IV contain the approximate number of cadets given the tests and the dates of each test (Beatty,1985:22-26).

Performance and retention data were also collected on each cadet up to the time of leaving the Academy either by withdrawal or graduation. The performance data were the cadet's spring semester 1983 Grade Point Average (GPA), Military Performance Average (MPA), retention data including date of attrition. The GPA and MPA were collected each semester and computed cumulatively (Beatty,1985:24).

Measures of key variables. In this study the primary measures employed are performance, attrition, trait personality measurements, and organizational commitment measurements. The two primary performance measures will be the Spring 83 semester Grade Point Average (GPA) and Military Performance Average (MPA). The GPA measures the academic performance of the cadet and falls in the range from 0.00 to 4.00. The MPA ranges from 0.000 to 4.000, and measures military performance using peer evaluations, cadet supervisor ratings, ratings by the Officer in charge of each

Table III
Sample and Missing Cases for Commitment Survey Data (adapted from Beatty, 1983:25)

Survey	Cadets available to take survey	Cadets given the survey	Approximate number who completed the survey	Percentage of completion
Commitment Questionnaires Administrations				
Pre-admission #2 (Jun 82)	1490	705	553	78.7
Basic Cadet Attitude #1 (Jul 82)	1489	880	836	95.0
End of BCT Attitude #1 (Aug 82)	1361	815	726	89.1
Fall Semester Attitude #2 (Nov 82)	1293	767	585	76.3
Spring Sem Attitude #2 Form A (Apr 83)	1162	902	392	43.4
Summer Sem Attitude (Aug 83)	1088	1088	763	70.1

Table IV
Sample and Missing Cases for STPI* Survey Data (adapted from Beatty,1983:25)

Survey	Cadets available to take survey	Cadets given the survey	Approximate number who completed the survey	Percentage of completion
State-Trait Personality Inventory Administrations				
Self Assessment Questionaire (Jul 82)	1489	880	807	91.7
Spring Sem Attitude	1162			
#1 Form B		315	172	54.6
#2 Form B		285	200	70.2
(Apr 83)				
Summer Sem Self Assessment Questionnaire (Aug 83)	1088	1088	620	57.0

* State-Trait Personality Inventory

cadet squadron, faculty instructors ratings, and military training grades (Beatty,1985:24). Attrition is a binary (zero - one) variable based on whether or not the cadet withdrew from the Academy before graduation. If the cadet was dismissed or withdrew voluntarily then a one is assigned to the record noting attrition, otherwise a zero is assigned noting retention.

The survey designed to measure organizational commit-

ment, the Organizational Commitment Questionnaire, was developed by Mowday, Porter, and Steers (1979). The subject is asked to respond to twelve questions using a seven point Likert scale with anchors at strongly agree, agree, slightly agree, neither agree nor disagree, disagree, slightly disagree, and strongly disagree. The results are scored based on the phrasing of the question with points that range from one to seven or vice versa because several of the items are phrased negatively to reduce test bias (Mowday and others,1974:227). The points are added together and divided by fifteen to give an organizational commitment score.

The Organizational Commitment score measures the relative strength of the individual's relationship with the organization. It is a measure of whether the individual strongly believes in and accepts the organization's goals, the willingness of the individual to sacrifice time, energy and other things for the organization, and the how strongly the individual desires to remain a part of the organization (Mowday and others,1974:26). In other words, it measures the degree to which the individual is deeply involved with the organization. A copy of the questionnaire is located in Appendix A.

The State-Trait Personality Inventory (STPI) is a sixty item self assessment instrument developed by Spielberger et al. (1979) to measure state and trait personality components. The personality inventory is actually

three tests compiled into one. The test is designed to measure anxiety, curiosity, and anger both as transitory experiences (states) or as predispositions of the individual (traits). The trait and state instruments consist of thirty questions each, equally divided to measure anxiety, curiosity, and anger. The trait anxiety scale measures the individual's proneness to interpret different situations as threatening. It seeks to measure the individual's disposition to react with elevations in the autonomic responses to a wide range of threatening conditions (Spielberger,1972). The trait curiosity scale is designed to measure individual differences in curiosity as a personality trait. It seeks to measure the range of situations which strikes the curiosity of the individual creating a desire to explore the environment. The trait anger scale is designed to measure the degree to which situations provoke feelings of anger in the subjects. It too seeks to measure the difference in the temperaments of individuals to interpret environmental factors as eliciting angered reactions. The version of the test that deals with personality states seeks to measure the intensity of the reactions the individual experiences in relating to the environment.

The STPI is also scored on the Likert scale with four anchors: "not at all", "somewhat", "moderately so", and "very much so." The scores are computed by treating each subtest as an individual test, summing all of the points

that pertain to that variable and dividing the number by ten. For example, score trait anxiety, add up all the points from the questions that relate to trait anxiety and divide the total by ten (the total number of questions on the test that deals with trait anxiety). To reduce the bias on the test some of these questions are reversed. A copy of the inventory is found in Appendix B.

Methods. The primary method employed to analyze the data will be polynomial regression analysis of equations (5) and (6). There are two primary regression models used in this study: the cusp regression model and the linear multiple regression model with an interaction term. Since it is assumed that attrition is a discontinuous or abrupt change in behavior resulting from the interplay of organizational commitment and one of the personality trait variables, it seemed appropriate to use the cusp regression model. The cusp regression model used was:

$$\text{Attrition} = b_0 + b_1\text{Perf}^3 + b_2\text{Perf}^2 + b_3(\text{Trait} \times \text{Perf}) + b_4\text{Com} + b_5\text{Trait} \qquad (6)$$

where Attrition is the attrition code for the individual. The attrition equals 1 if the cadet withdrew from the Academy before graduation in the spring of 1986 and 0 if not.

Perf is the standardized score of either the cadets' spring semester 1983 GPA or MPA. The score is standardized by the equation (4), for example

$$\text{Perf} = (\text{GPA} - \text{Min}(\text{GPA}))/\text{STD}$$

where STD is the standard deviation.

Trait is the individual's score on either the anxiety, curiosity, or anger inventory taken in

July 1982.

Com is the individual's commitment score taken in July 1982.

In other words there were six cusp regression models used, three used GPA as the performance variable and three used MPA. Each model used either anxiety, curiosity or anger as the trait variable. The variable common in the six models was organizational commitment. In terms of the cusp regression model presented in Chapter 2, the behavioral variable will be GPA or MPA, the control factors are organizational commitment (the normal or asymmetry factor) and either anxiety, curiosity, or anger (the splitting or bifurcation factor).

The linear multiple regression model (referred to as the multiple regression model or the linear regression model) was used in order to draw comparison with the cusp regression model since it was hypothesized that the cusp model would explained more of the variance than the regression model. The multiple regression model (Sheridan,1985:97) used was:

$$\text{Attrition} = \text{Perf} + \text{Trait} + \text{Com} + (\text{Trait} \times \text{Com}) \qquad (7)$$

where variables are the same as those defined for equation (6).

The model was tested using the same combination of variables as the cusp regression model.

The results from the analysis of the two regression models are presented in the next chapter.

IV. Results

Introduction

This chapter presents the results of the cusp regressional analysis and the multiple regressional analysis. The models are compared to determine which provides the best fit to the data. The models are evaluated by using correlational analysis, analysis of variance, regression analysis and analysis of the coefficients of determination.

Descriptive Statistics

Table V contains the descriptive statistics for data base used in this study.

Table V. Summary Statistics

VARIABLE	MEAN	STD DEV	STD ERR
********** NON- ATTRITION GROUP **********			
N= 298			
GPA	2.79	0.553	0.032
MPA	2.89	0.350	0.020
COM	5.12	0.746	0.043
ANX	1.87	0.490	0.028
CUR	3.07	0.507	0.029
MAD	1.89	0.480	0.028
********** ATTRITION GROUP **********			
N= 42			
GPA	2.12	0.806	0.124
MPA	2.53	0.427	0.066
COM	5.13	0.937	0.143
ANX	1.82	0.407	0.063
CUR	3.18	0.461	0.071
MAD	1.84	0.462	0.071

An analysis was performed on the means of each to determine if there were a significant difference between the two groups. There were no significant differences between the means of the two groups among all the variables except the standardize grade point average (ZGPA) which was significant at p< .0001, and standardize military performance average (ZMPA) which was significant at the same level.

Correlational Analysis

The analysis of the relationship between the variables shows some significant results. Table VI contains the correlational values. There is a significant (p< 0.0001) correlation between the control variables used in this analysis. There is a strong positive correlation between commitment (COM) and curiosity (CUR) (r= 0.412). There are strong negative correlations between commitment (COM) and anxiety (ANX) (r= -0.318) and commitment (COM) and anger (MAD) (r= -0.169, p= 0.0018). The data indicates that the more committed individuals were also the more curious individuals. Furthermore, it indicates that the more angered or anxious cadets were also the less committed cadets. This is not to say that there exist a causal relationship between the two variables, but it shows the existence of some relationship between the variables.

There exist strong correlations between several of the

trait variables. There is a strong positive correlation between anxiety and anger (r= 0.389, p< 0.0001); and significant negative correlations between anxiety and curiosity (r= -0.467; p< 0.0001) and curiosity and anger (r= -0.156, p= 0.0039). This information indicates that cadets who scored high in trait anxiety also scored high in trait anger. On the other hand, those cadets who scored high in trait curiosity score low in trait anger and anxiety. This implies that high trait anxiety individuals have a propensity to score high in trait anger and low in trait curiosity.

Table VI. Pearson Correlation Coefficients

	GPA	MPA	COM	ANX	CUR	MAD
CODE	-.353**	-.305**	.006	-.026	.080	-.036
GPA		.448**	-.064	.024	.040	.035
MPA			.105*	.009	.072	-.067
COM				-.318**	.412**	-.169**
ANX					-.467**	.389**
CUR						-.156**

* p approaches p< .05
** p< .0001
All other relationships are not significant.

The correlation between the behavioral variables, grade point average (GPA) and military performance average

(MPA), indicate the expected strong positive relationship ($r = 0.448$, $p < 0.0001$). However, an analysis of the behavioral variable with the control variable indicate an insignificant correlations except in the case of the correlation between military performance average and commitment ($r = 0.105$, $p = 0.0535$) which approaches significance. The relationship between the behavioral variables and the control variables indicate that they are independent of one another. The only exception is found between military performance average and organizational commitment whose relationship is approaching significance at an alpha = 0.05 level.

Models

There are two basic models used in this study on regression analysis. The first model is the multiple regression model (7):

$$\text{Attrition} = b_0 + b_1\text{PERF} + b_2\text{COM} + b_3\text{TRAIT} + b_4(\text{COM X TRAIT})$$

where Attrition is a binary variable (0- stay, 1- leave)

PERF represents either grade point average (GPA) or military performance average (MPA) from the spring semester 1983

COM represents the organizational commitment score from July 1982

TRAIT represents one of the trait variables, anxiety (ANX), curiosity (CUR), or anger (MAD) score measured in July 1982.

The second model examined in this study is the cusp regression model (6):

$$\text{Attrition} = b_0 + b_1 PERF^3 + b_2 PERF^2 + b_3(PERF \times TRAIT) + b_4 COM + b_5 TRAIT$$

Where the variable meaning are the same as those above.

Since the correlation analysis showed that several of the variables in the models were significantly correlated, the variation inflation method was used to determine the significance of multicollinearity (Neter and others, 1985:390 -393). The variance inflation factors were computed, and showed that the multicollinearity amongst the variables was not significant, consequently the models are appropriate. The variance inflation factors are computed by squaring the tolerances listed in Appendix E.

Analysis of Variance

In order to determine the appropriateness of the model in explaining variance, it is important to analyze the variance that is explained by the model. Each model's total variation of the observations from the mean of the observations, known as the corrected total sum of squares (SSTO), equals 36.81176 with 339 degrees of freedom. The following paragraphs will discuss the models partitioning of the SSTO.

In the linear regression models, the common variable in each model is organizational commitment (COM). The performance variables are grade point average (GPA) and military performance average (MPA). The other independent variable are one of the trait variables, anxiety (ANX),

curiosity (CUR) or anger (MAD). The interaction term in the model represents the interaction between COM and one of the trait variables. Therefore, given the possible combination of the variables six models are examined. Table VII contains the ANOVA data. Since all of the variables are the same in each model except the performance variable and the trait variable, each model is listed according to those two variables. There are five parameters in each of the model and the SSTO is 36.8118. The F values are significant at the 0.0001 level. The models are grouped based on their performance variables.

Table VII. Multiple Regression ANOVA Data

MODEL	SSR	SSE	F	R-SQUARED
GPA and ANX	5.4339	31.3779	14.40	0.1476
GPA and CUR	5.5835	31.2283	14.97	0.1517
GPA and MAD	5.0168	31.7950	13.21	0.1363
MPA and ANX	3.9822	32.8296	10.16	0.1082
MPA and CUR	4.1096	32.7022	10.52	0.1116
MPA and MAD	3.8077	33.0040	9.66	0.1034

The following is the comparison of the analysis of variance (ANOVA) between models that used GPA as their performance variables. In the model that contained anxiety as its trait variable, it is evident from the overall F - test that at least one of the regression coeffi-

cients does not equal zero. In the model that examines the regression relationship using curiosity as the trait variable, the ANOVA analysis indicates that that the over all F - test is significant. When the model using anger as the trait variable is examined, model yields a significant overall F - test.

An examination of the models using MPA as the performance variable gives the following results. In the model that uses ANX as the trait variable, the overall F - test yielded a significant F value. The model that uses CUR as its trait variable, has a significant overall F - test value. And the model that uses MAD as its trait variable, the overall F - test is significant indicating that at least one regression coefficient does not equal zero.

The analysis of variance (ANOVA) for the cusp model, presented in Table VIII, has the same total variation as the regression but the number of parameters estimated are six (including the intercept) instead of five. The common variable among these models was commitment, the asymmetry factor. All of the models that contain grade point average as the performance factor yields significant overall F test values. When the analysis is performed on the models that uses military performance average as their performance variable, the overall F test values are significant. In Table VIII, all of the overall F test values are significant at 0.0001 level. The models are identified in the

same manner as those for the multiple regression model. There are six parameters in this model with the SSTO equal to 36.8118.

Table VIII. Cusp Regression ANOVA DATA

Model	SSR	SSE	F	R-SQUARED
GPA and ANX	7.1952	29.6166	16.23	0.1954
GPA and CUR	7.9859	28.8259	18.51	0.2169
GPA and MAD	7.5638	29.2580	17.27	0.2055
MPA and ANX	4.4558	32.3560	9.20	0.1210
MPA and CUR	4.6879	32.1239	9.75	0.1273
MPA and MAD	4.7191	32.0927	9.82	0.1282

Regression Analysis

This section lists the information obtained from the regression analysis performed on the data. It presents the coefficents of the linear regression model equation (6) in Table IX, first, followed by the analysis of the cusp regression model equation (5) in Table X. The data gathered from the linear regression model using GPA as the performance variable and anxiety as the trait variable indicates that all of the coefficients are significant at the 0.01 significance level. In the model with curiosity as the trait variable, all of the regression coefficients are significant at the 0.05 level. In analyzing the model which has anger (MAD) as its trait variable, each coeffi-

cient is significant at the 0.05 level.

When the performance variable is changed to military performance average (MPA), the following results are obtained. When the performance variable is anxiety the partial regression coefficients are significant at the 0.05 level. If the performance variable is changed to curiosity , the partial regression coefficients for MPA and CUR are significant at the 0.05 level, and the other variables being insignificant at that level. When anger becomes the trait variable, the coefficent for MPA being significant at the 0.05 level, and MAD being significant at the 0.1 level.

Table IX. Regression Coefficients for Linear Regression Model.

	PERF	COM	TRAIT	TRAIT X COM
Model using GPA				
ANX	-0.1184	-0.2627	-0.6973	0.1332
CUR	-0.1208	0.2779	0.5888	-0.1001
MAD	-0.1199	0.1800	-0.4862	0.0924
Model using MPA				
ANX	-0.0992	-0.1819	-0.5384	0.1037
CUR	-0.1012	0.2271	0.4474	-0.0747
MAD	-0.1037	-0.1164	-0.3907	0.0701

The coefficients from the regression analysis of the cusp model are presented in Table X. In the models that used grade point average as the performance variables the following results were observed. When anxiety is used as the trait variable, the partial regression coefficients for the GPA cubed and GPA squared terms were significant at a p- value approaching less than 0.0001. When curiosity is used as the trait variable, the significant parameters are GPA cubed, CUR, and the interaction terms at the .05 or less level. If anger is used as the trait variable the significant partial regression coefficients are the cubed term, the squared term, and the interaction term at the 0.05 level.

When the performance variable becomes military performance average the following results are observed in the cusp catastrophe regression model. In the model that employs anxiety as its trait variable, the regression coefficients for the cubic and squared MPA terms are significant at the .05 level. If curiosity is used as the trait variable, then the coefficients for the cubed and squared terms are significant at the 0.05 level. And finally, when anger is employed for the trait variable, the parameter estimates for the cubed and squared terms are significant at the 0.0001 level.

justed R-squared values were calculated to take into account the number of parameters in the model, since the more parameters in the model the greater will be the value of R-squared (Neter and others, 1985:241). Table XI contains these values also.

Table XI. The Coefficients of Determination and their Adjusted Value

MODEL	R-squared	Adj R-squared
Regression		
GPA & ANX	0.1476	0.1374
GPA & CUR	0.1517	0.1415
GPA & MAD	0.1363	0.1260
MPA & ANX	0.1082	0.0975
MPA & CUR	0.1116	0.1010
MPA & MAD	0.1034	0.0927
Cusp Regression		
GPA & ANX	0.1954	0.1834
GPA & CUR	0.2169	0.2052
GPA & MAD	0.2055	0.1936
MPA & ANX	0.1210	0.1079
MPA & CUR	0.1273	0.1143
MPA & MAD	0.1282	0.1151

Summary

The findings presented in this chapter showed that there were significant correlation between the trait variables, and between the trait variables and organizational commitment. It showed a positive relationship between

commitment and curiosity, and a strong negative relationship between commitment and anxiety, and commitment and anger. The variance inflation factors were calculated to determine the extent of multicollinearity. It was determined that no one independent variable exerted a significant influence over the other variables in the model.

Once it was determined that the control variables were essentially independent, then an analysis of variance was performed on both the multiple linear regression model and the cusp regression model. The overall F test for each of the ANOVA analyses was significant at the $p < 0.0001$ level, indicating that a significant amount of variation were explained by each of the different models.

After the ANOVA analyses was completed, regression analysis were performed on each of the models. The regression analysis gave some interesting results. In the multiple regression model that use GPA and ANX along with COM, all of the parameters were significant at the 0.05 level; whereas, in the model that used GPA and CUR, all parameters except the intercept were significant at the 0.05 level. In the model that employed GPA and MAD, all of the parameters were significant at 0.05 level. When the MPA is substituted for GPA, the ANX model still had all parameters significant at the 0.05 level, the CUR model had only two parameters that were significant, the MPA and CUR coefficients; and the MAD model had only two significant parameters, the intercept and MPA coefficients.

The regression analysis of the cusp model produced the following results. In the models that used GPA, only three parameters were significant in the ANX model, only three were significant in the CUR model, and four parameters approached significance in the MAD model. When MPA is used instead of GPA, there are only three significant parameters in the ANX model, two in the CUR model, and three in the MAD model at the 0.05 level.

Finally, an examination was made of the coefficients of determination, and the adjusted coefficients of determination. This examination showed that no model could explain more than 22 percent of the variation in the observations.

V. Discussion and Conclusion

Introduction

This chapter discusses the interpretations and implications of the results given in Chapter IV. It answers the questions posed in Chapter I and explains the correlation between the trait variables, the appropriateness of the performance variables, the aptness of the trait variables, the difference between the cusp and the multiple regression models, and the effects that trait anxiety and organizational commitment have on attrition.

Trait Variables Correlation

The results from the correlational analysis performed on the trait variables show significant correlations between them. It is evident from the analysis that those individuals who scored high in anxiety also scored high in anger. This indicates that those cadets who were prone to be more anxious were also prone to be more angry. The cadets who were more likely to interpret a wider range of stimuli in the environment as threatening were also more prone to be angered by a wider variety of environmental stimuli. It seems that the rigors of the Academy environment with it's emphasis on discipline and conformity tended to make these students both angry and anxious. The anxiousness could be the result of placing these highly quali-

fied individuals in the ego threatening environment of the Academy, where ridicule and a strict class system were the order of the day. Some of these cadets could not handle these conditions as effectively as others. The inability to handle this environment, thus minimizing their anxiety, may have made them more angry. The Academy environment served only to accentuate those predisposition. It is important to note that the trait data analyzed was collected in July of 1982, during their first week of Basic Cadet Training when they were first introduced to the military environment of the Academy. The rigors of that period of training, where many of the cadets are introduced to military discipline for the first time, was an extremely stressful period. For those cadets who are less capable of handling threatening situations, there existed a significant probability that the situation angered them.

There were also significant negative correlations between trait curiosity and anxiety, and trait curiosity and anger. The more anxious individuals were less likely to explore their environment or to question their situations. This seemed to follow naturally, since those cadets who had an high trait anxiety score were more likely to interpret a wider variety of environmental factors as stressful, they would be less inclined to explore that environment or to question it's limits. They would be less inclined to explore the environment or to ask questions of the Cadre, those cadets who are in leadership position, for

fear of public ridicule.

Additionally, individuals who possessed the disposition of being easily aroused to anger by a wide variety of events would tend to be less likely to seek opportunities to elicit an angry reactions. This assumes that most people seek to relieve or release their angry feelings instead of harboring them. The high-angry cadets finds in the Academy environment a stimulus that elicits their anger reactions and thus wishes to avoid further involvement with that environment.

Appropriate Performance Variable

In order to determine the appropriateness of the performance variables in explaining attrition, a comparison was made between the models that employ grade point average and those that employ military performance average. If an examination is conducted involving the adjusted R-squared values (see Table XI) for each the models, then clearly grade point average is the more appropriate performance variable in explaining attrition. In other words, more of the variance was explained in models that used grade point average than in models using military performance average. This is possible due to the nature of the two variables. Grade point average is the measure of the cadet's performance in the academic subjects of the Academy; whereas, military performance is the ratings of the cadet's instructors, upper classmen and peers con-

cerning military performance. The grade point average is a more objective and standardize assessment of the cadet's ability than the military performance which depends on the subjective assessment of the instructors and the cadet's peers. Also, since academics is a major part of the Cadets life, thus grade point average which measures academic progress would provide a better explanation of attrition than military performance average.

Trait Variable Aptness

To determine which of the trait variables best explained attrition, an examination of the adjusted coefficients of determination was conducted. When a comparison is made, those models which contained trait curiosity had a higher R-squared value in three out of the four groupings. In the cusp regression analysis with military performance average, trait anger with a R-squared equaled to Ø.1151 was marginally better than trait curiosity with an R-squared of Ø.1143. After the fact, it is evident that trait curiosity would have been a better choice for the trait variable than trait anxiety. The cadets in the attrition category exhibited a higher mean trait curiosity score on State-Trait Personality Inventory than the non-attrition cadets. These findings are confirmed by the Spielberger study, which showed that Navy recruits who were in the Disciplinary Problem Group scored significantly higher in trait anxiety than the Academic Problem

Group or the No Problem Group (Spielberger and Barker,1979:10).

An analysis of the regression coefficients (Table X) for the cusp model employing GPA and ANX shows that the anxiety score did not make a significant contribution to the expected value of the model. When the t test of the coefficient was conducted, the p value was .34 indicating that the regression coefficient may be zero. In fact, the only model that contains a trait that is significant enough not to equal zero is the model using trait curiosity and grade point average. In that model trait curiosity contributes significantly (p = .0035) to the expected attrition value.

Clearly, trait curiosity is better at explaining attrition in a model using grade point average than either trait anger or anxiety. However, it military performance average is used, none of the trait variable are significant at the .05 level.

Cusp vs. Multiple Regression

In order to make a valid comparison of the cusp regression model and the multiple regression model, the adjusted R-squared values were computed for each of the models. The adjusted R-squared values takes into account the number of parameters in each model. When comparisons were drawn between the cusp model and multiple regression model using grade point average (GPA) and anxiety (ANX),

the cusp regression model had the better R-squared value (.18 as opposed .14 for the multiple regression model). When the same comparison was made between the models using GPA and curiosity (CUR), the cusp regression model gave a better explanation of the variance. If the values in Table XI are compared with each other, categorically the cusp regression model gives a better fit to the data than the regression model. The cubic and quadratic performance variables in the cusp model when introduced into the model provided a significant reduction in variance. This was due to the significant ($p < .001$) correlation between attrition and the performance variables. Regardless of which model was chosen the performance variables were significant, and the organizational commitment variable was not. So naturally the cusp model would give a better fit because of the addition of the cubic and quadratic performance variables.

Effects of Anxiety and Organization Commitment

The analysis demonstrated that trait anxiety and organizational commitment affect attrition. The cusp regression model that uses anxiety and organizational commitment as the control variable and grade point average as the behavioral variable explained 18 percent of the variation as opposed to the multiple regression model's 14 percent. This is similar to the amount variation explained in the models (13 and 21 percent) used in the Sheridan studies (Sheridan,1985).When military performance

average was used as the behavioral variable, the cusp model explained 11 percent of the variation and the multiple regression model explained 10 percent.

The regression coefficients suggested that the GPA cubed term would add .02 to the predicted attrition rate, the GPA squared term would subtract .14 from the predicted attrition percentage rate for every unit increase in the grade point average. This implies that those cadets with high grade point average are less likely to separate before graduation if all else is held constant. The trait anxiety coefficient indicated that there was a two percent reduction in the attrition rate for each unit increase in the anxiety score; however this coefficient is not significant. Consequently, trait anxiety in this model did not exert any significant influence on the attrition code. Thus trait anxiety had minimal affect on attrition. A possible reason for this result is the influence being exerted on the score by the interaction term of GPA and ANX which also had an insignificant effect on the probability of attrition. The primary contributor to the probability of attrition in this model were the terms which contain grade point average.

Even though this study sought mainly to see how trait anxiety and organizational commitment affect attrition, a better model would have substituted trait curiosity for trait anxiety. The model involving trait curiosity and

grade point average would explain 21 percent of the variation. In examining the regression coefficients from this cusp regression model, the GPA cubic term added .Ø1 to the attrition percentage, and the squared term subtracted Ø.Ø6 from the probability of attrition for each unit increase in the trait curiosity score. The curiosity regression coefficient added .27 to the probability of attrition implying that the higher the curiosity score the more likely the probability of attrition with all other factors constant. This indicates that trait curiosity along with the other parameters in the model can provide good information when considering attrition at the Academy.

Conclusions

This study examined the effects of trait anxiety and organizational commitment on attrition at the academy using the cusp catastrophe model. It was evident from the analysis that the cusp model provides the best fit to the data. The cubic and squared terms allowed the cusp model to provide a better fit to the binary dependent variable. The cusp model demonstrated better potential in explaining behavioral problems.

Given the appropriateness of the cusp regression model to explain behavior, it seems that the true parameters of that model should be trait curiosity and organizational commitment as the control factors, and grade point average as the behavioral measure. According to the analysis,

curiosity was a better measure of attrition than anxiety. The analysis shows that highly curious cadets are more likely to separate from the Academy than the low curiosity cadets. The more curious the individuals are the more prone they will be to getting into trouble or to voluntarily separating from the Academy to pursue other interest.

It was apparent that attrition can be modeled as a discontinuous process which was effected by trait curiosity (or trait anger,or anxiety) and organizational commitment. This implies that these highly qualified cadets reached a point where their commitment to the Academy and their personality traits were at odds with each other, and they decided to leave. This actions comes abruptly, when the cadets decide that they can not take it any longer. This point is arrived at when the cadets' anxiety or curiosity threshold is reached. At that point the cadets seek other avenues to meet the their needs. Figure 4 demonstrates the concepts involved in the process of attrition. Basically, when a cadet enters the academy he is position some where on the behavior plane. As trait anxiety and organizational commitment changes the behavior of the individual changes. The cadet tries to stay with the Academy as long as he can, but once he reaches his anxiety threshold, he finds himself deciding between leaving the Academy or continuing. At some point, as the anxiety increases, he finds he must withdraw from the academy in order to reduce his anxiety level. At that point he has crossed the cusp (the bifurca-

tion set on the control plane), unto the termination plane, he has decided to leave. During this period of increase anxiety, the individual's grade begin to fall, and other factors appear that demonstrates his dissatisfaction with the Academy.

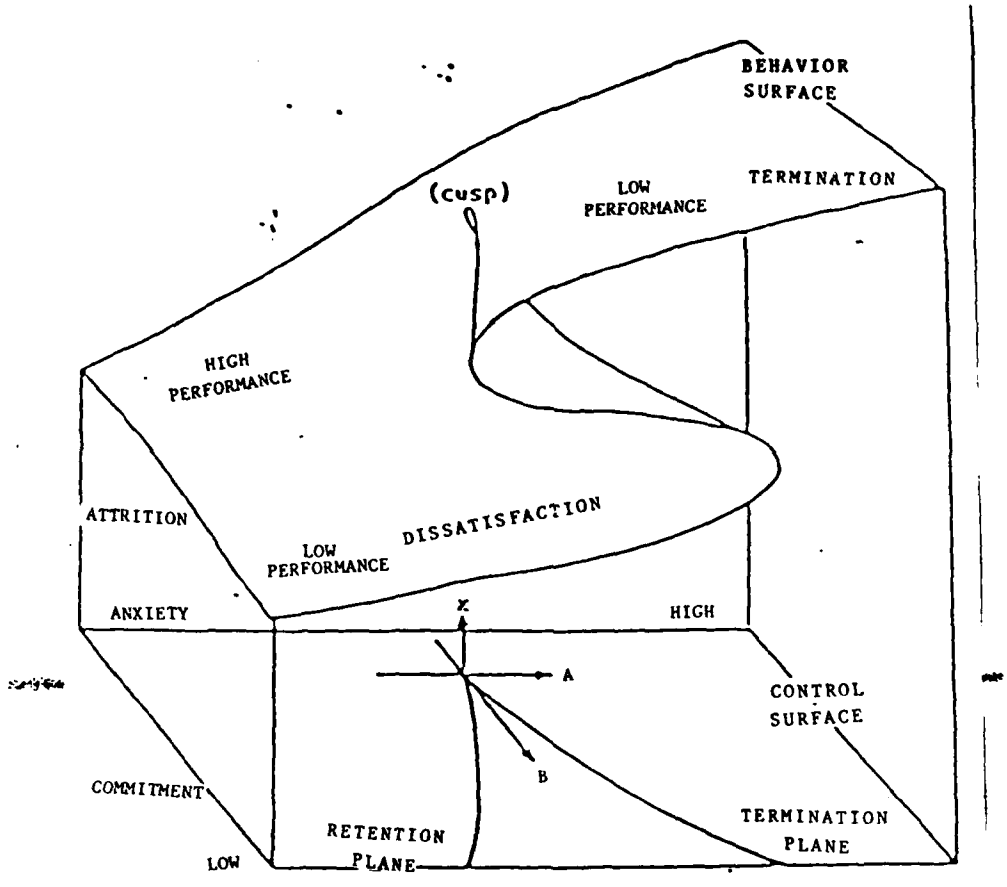

Figure 4. Diagram of the Cusp Model.

The attrition rate at the Academy is high among these highly qualified selectees. It seems that trait anxiety is not the major contributor to the withdrawal rate, but trait curiosity is. The cadets were not leaving because of the

rigors of the Academy life, as much as, from the need to experience new and different things. The Academy is not keeping the interest of some cadets and is consequently losing them. If the Academy is going to stem the tide of attrition, then it must provide an atmosphere that will challenge the cadets to go beyond the present environment and to seek new and different experiences.

This study basically replicates the study done by Sheridan (1985) with nursing employees. This study was done to determine if similar results would be obtained using a different population and different control variables. It is evident that the results in this study are similar to the Sheridan study.

VI. Recommendations

This study attempted to explain attrition as a combination of personality variables and organizational commitment. There were two major focuses of this study: the applicability of the cusp catastrophe model, and the usefulness of the behavioral variables in explaining attrition. It was demonstrated that the cusp regression model can provide a useful means of explaining attrition. Further work needs to be done in the area of parameter estimation for that model. The amount of variance explained by the cusp model is good when compared to the multiple regression model, but it can be better. There needs to be more research conducted on the cusp model and more applications made of it's unique way of modeling phenomena. This study only began to scrape the surface of the usefulness of the model in explaining human behavior.

Additionally, further work needs to be done using the personality variables (anxiety, curiosity, and anger) as means of understanding the attrition process. There are other variable with which these measures could be regressed in order to see their affect on attrition. There needs to be a more detailed treatment done with curiosity and anger and their possible ramifications on attrition. This study sought of gloss over any detailed explanations of these variables.

Finally, there needs to be some studies done that

employs some of the more sophisticated models of catastrophe theory, such as the butterfly model, which allows more control and behavioral variables to be analyzed.

Appendix A

Organizational Commitment Questionnaire

This appendix contains the a listing of the items from the Organizational Commitment Questionnaire (OCQ) used at the Air Force Academy and the means and standard deviations of the sample used to check the validity of the actual version of OCQ.

Instructions taken from the OCQ

Listed below is a series of statements that represent possible feelings that individuals might have about the Air Force Academy. With respect to your feelings about the Air Force Academy, use the scale below and indicate the degree of your agreement or disagreement with each statement by marking the appropriate letter on the answer sheet.

---

1. I am willing to put in a great deal of effort beyond that normally expected in order to help the Air Force Academy be successful.

2. I talk up the Academy to my friends as a great place to go to school.

3. I feel little loyalty to the Air Force Academy. (R)

4. I find that my values and the Academy's values are very similar.

5. I am proud to tell others that I will be part of the Academy.

6. Rather than the Air Force Academy, I could just as well be going to another service academy. (R)

7. The Academy will really inspire the very best in me in the way of military and academic performance.

8. It would take very little change in my present circumstances to cause me to leave the academy. (R)

9. I am extremely glad that I chose to attend the Air Force Academy over other service academies or colleges.

10. I really care about the future of the Academy.

11. For me, the Air Force Academy is the best of all possible service academies to attend.

12. Deciding to enter the Academy was a definite mistake on my part.

The cadets were asked to respond on a scale ranging from 1 to 7, where 1- strongly diagree, 2- disagree, 3- slightly disagree, 4- neither agree nor disagree, 5- slightly agree, 6- agree, 7- strongly agree.

(R) indicates items that had been negatively phrased, indication a reversed scoring.

Means, Standard Deviations, and Internal Consistencies for the actual version of the Organizational Commitment Questionnaire (MSP,1979:232).

Subjects	N	Mean	STD	Coefficient
Public Employees	569	4.5	.90	.90
Classified University employees (a)	243	4.6	1.30	.90
Hospital employees(a)	382	5.1	1.18	.88
Bank employees	411	5.2	1.07	.88
Telephone Company employees	605	4.7	1.20	.90
Scientist and Engineers (a)	119	4.4	.98	.84
Auto Co. managers	115	5.3	1.05	.90
Psychaitric Technicans (b)	60	4.0/3.5 4.3/3.5 4.3/3.3 4.0/3.0	1.00/1.00 1.10/0.91 0.96/0.88 1.10/0.98	.82-.93
Retail Management Trainees	59	6.1	.64	NA

(a) A nine-item shortened version of the OCQ was used in this study.

(b) For this sample. means and standard deviations are reported for stayers and leavers across four time periods.

Appendix B

The State Trait Personality Inventory (STPI)

This appendix contains the listing of the State Trait Personality Inventory (Form X-2) given to the cadets at the Air Force Academy. The means and standard deviation presented in this appendix are based on the test given to recruits to check the validity of the test.

Directions for the State portion of the inventory

A number of statements that people have used to describe themselves are given below. Read each statement, then use the scale below to indicate HOW YOU FEEL RIGHT NOW. Darken the appropriate letter on the answer sheet. There are no right or wrong answers. Do not spend too much time on any one statement but give the right answer which seems to describe your PRESENT FEELINGS best.

---

1. I feel calm. (A) (R)

2. I feel like exploring my environment. (C)

3. I am furious. (Ag)

4. I am tense. (A)

5. I feel curious. (C)

6. I feel like banging on the table. (Ag)

7. I feel at ease. (A) (R)

8. I feel interested. (C)

9. I feel angry. (Ag)

10. I am presently worrying over possible misfortunes. (A)

11. I feel inquisitive. (C)

12. I feel like yelling at somebody. (Ag)

13. I feel nervous. (A)

14. I *am in* a questioning mood. (C)

15. I feel like breaking things. (Ag)

16. I am jittery. (A)

17. I feel stimulated. (C)

18. I am mad. (Ag)

19. I am relaxed. (A) (R)

20. I feel mentally active. (C)

21. I feel irritated. (Ag)

22. I am worried. (A)

23. I feel bored. (C) (R)

24. I feel like hitting someone. (Ag)

25. I feel steady. (A) (R)

26. I feel eager. (C)

27. I am burned up. (Ag)

28. I feel frightened. (A)

29. I feel disinterested. (C) (R)

30. I feel like swearing. (Ag)

Instruction Trait section of the inventory

A number of statements that people have used to describe themselves are given below. Read each statement, then use the scale below to indicate HOW YOU GENERALLY FEEL. Darken the appropriate letter on the answer sheet. There are no right or wrong answers. Do not spend too much time on any one statement but give the right answer which seems to describe how you GENERALLY feel.

---

31. I am a steady person. (A) (R)

32. I feel like exploring my environment. (C)

33. I am quick tempered. (Ag)

34. I feel satisfied with myself. (A) (R)

35. I feel curious. (C)

36. I have a fiery temper. (Ag)

37. I feel nervous and restless. (A)

38. I feel interested. (C)

39. I am a hotheaded person. (Ag)

40. I wish I could be as happy as others seem to be. (A)

41. I feel inquisitive. (C)

42. I get angry when I'm slowed down by others mistakes. (Ag)

43. I feel like a failure. (A)

44. I feel eager. (C)

45. I feel annoyed when I am not given recognition for doing work. (Ag)

46. I get in a state of tension or turmoil as I think over my recent concerns and interests. (A)

47. I am in a questioning mood. (C)

48. I fly off the handle. (Ag)

49. I feel secure. (A) (R)

50. I feel stimulated. (C)

51. When I get mad, I say nasty things. (Ag)

52. I lack self-confidence. (A)

53. I feel disinterested. (C) (R)

54. It makes me furious when I am criticized in front of others. (Ag)

55. I feel inadequate. (A)

56. I feel mentally active. (C)

57. When I get frustrated, I feel like hitting someone. (Ag)

58. I worry too much over something that really does not matter. (A)

59. I feel bored. (C) (R)

60. I feel infuriated when I do a good job and get a poor evaluation. (Ag)

The cadets were asked to respond to the question by marking the appropriate letter on the answer sheet: A- almost never, B- sometimes, C- often, D- almost always.

The letters in parenthesis represents the following measures: (A) - Anxiety, (C) - Curiosity, (Ag) - Anger.

(R) indicates those items which are negatively phrased, and reverse scored.

A Comparison of the Means and Standard Deviations between the Navy Recruits and College Students (Spielberger and Barker, 1979:62)

Measure	Navy males(N=192)	College Males(N=654)
Trait Anxiety		
Mean	40.12	37.90
STD	9.53	8.88
State Anxiety		
Mean	48.98	38.43
STD	12.38	8.68
Trait Curiosity		
Mean	44.08	46.10
STD	6.37	6.35
State Curiosity		
Mean	42.44	42.77
STD	8.31	9.66
Trait Anger		
Mean	31.66	28.83
STD	7.63	6.59
State Anger		
Mean	27.14	20.62
STD	9.39	8.59

All group means are significantly different (using the t-test) from the Navy group, except for the state curiosity group means.

Appendix C

Data Base and Survey Listing

Data Base

The Office of Institutional Research compiled a research file on the Class of 1986. The research file was stored on a magnetic tape, 1600 BPI, in EBCDIC. Each block contained one record, which consisted of 3340 characters. The tape contained a total of 1494 records which represents the total number of cadets who entered the Class of 1986 in the summer of 1982.

The Cadet's record contains personal demographic data; semester data, which includes GPA, MPA, and other performance data; and attrition data including attrition codes, the semester and year that the cadet attrited. The semester data is identified by an alphabetic code: A- standard summer semester, B- fall semester, and C- winter semester. The standard cadet entered the academy during the summer of 1982 (82A) for the Basic Cadet Training Program; and will graduate in the spring of 1986 (85C). This data base is current through 85C.

The main portion of the file consists of the 19 possible surveys and questionnaires totaling approximately 2039 characters. Each survey contains a six-character identifier followed by the appropriate responses (Beatty, 1985: Appendix E).

Survey Listing

The following is the list of the surveys and questionnaires that administered by the Office of Institutional Research that are used in this study.

Commitment Survey

Basic Cadet Attitude Survey - 2	Jul 82	Q55 to Q66

State Trait Personality Inventory Survey

Self-Assessment Questionnaire	Jul 82	Q85 to Q114

Contents of the file

The following pages contains the contents of the master file. These pages present the exact content breakdown of a record in the data base file.

Appendix D
Attrition Codes and Reasons

CODE	STATUS	REASON
1Ø	DISCH	Academic and Military Deficiency
11	DISCH	Military Deficiency
12	DISCH	Dismissed by Direction of Court Martial
13	DISCH	Voluntary Discharge
1A	DISCH	Medical
1B	DISCH	Conduct
1C	DISCH	Academic
1D	DISCH	Aptitude
1E	DISCH	Aptitude and Conduct
1F	DISCH	Aptitude and Academic
1G	DISCH	Conduct and Academic
1H	DISCH	Failure in Summer Training
1I	DISCH	Failure in Physical Education
1J	DISCH	Honor
1K	DISCH	Honor-Lying
1L	DISCH	Honor-Stealing
1M	DISCH	Honor-Cheating
1N	DISCH	Honor-Toleration
1O	DISCH	Honor-Lying and Stealing
1P	DISCH	Honor-Lying and Cheating
1Q	DISCH	Honor-Lying and Toleration
1R	DISCH	Honor-Lying, Stealing and Cheating
1S	DISCH	Honor-Lying, Cheating and Toleration
1T	DISCH	Honor-Lying, Cheating, Stealing and Toleration
1U	DISCH	Honor-Stealing and Cheating
1V	DISCH	Honor-Stealing and Toleration
1W	DISCH	Honor-Stealing, Cheating and Toleration
1X	DISCH	Honor-Cheating and Toleration
1Y	DISCH	Honor-Used Honor Code as a Means of Departing
1Z	DISCH	Aptitude, Conduct, and Academic
2A	RESGN	Insufficient Desire to Complete
2B	RESGN	Dislike Instructional Methods
2C	RESGN	Pressure of Academic System
2D	RESERVED	
2G	RESGN	Unwilling or Unable to Make Group Adjustment
2H	RESGN	Too much Regimentation and Lack of Personal Freedom
2I	RESGN	Too much Competition
2J	RESGN	Disappointed in Caliber of Cadets, Peers, Upperclassman
2P	RESGN	Lack of Desire or Motivation
2Q	RESGN	Insufficient Desire to Complete Academy

		Program
2R	RESGN	Always Desired Another Career
2S	RESGN	Change Career Interest After Entering
2T	RESGN	Change in Physical Condition not Requiring Seperation
3A	RESGN	Honor-Lying
3B	RESGN	Honor-Stealing
3C	RESGN	Honor-Cheating
3D	RESGN	Honor-Toleration
3F	RESGN	Honor-Lying and Stealing
3G	RESGN	Honor-Lying and Cheating
3H	RESGN	Honor-Lying and Toleration
3I	RESGN	Honor-Lying, Stealing and Cheating
3J	RESGN	Honor-Lying, Cheating and Toleration
3K	RESGN	Honor-Lying, Cheating, Stealing and Toleration
3L	RESGN	Honor-Stealing and Cheating
3M	RESGN	Honor-Stealing and Toleration
3N	RESGN	Honor-Stealing, Cheating and Toleration
3O	RESGN	Honor-Cheating and Toleration
3P	RESGN	Honor-Used Honor Code as a Means of Departing
4A	RESGN	Personal Reason
4B	RESGN	Personal-Marriage
4C	RESGN	Personal- to be Married
4D	RESGN	Personal-Lack of Confidence
4E	RESGN	Personal-Hardship
4F	RESGN	Personal-Good of Service
4G	RESGN	Personal-Inability to Cope with Military Training Program
4H	RESGN	Personal-Unable/Unwilling to Accept All of Honor Code
4P	RESGN	Other- Unclassified
4Q	RESGN	Resign in Lieu of Board Action/Lack of Military Aptitude
4R	RESGN	Conscientious Objector
4S	RESGN	Anti-Military Feelings
4T	RESGN	Parental Pressures
4U	RESGN	In Lieu of Board Action/Conduct
4V	RESGN	In Lieu of an Honor Board Hearing
5A	Deceased	
5B	Involuntary Seperation Other	
6A	Departed Pending Turnback	
6B	Turnback	
6C	Turnforward	
6D	Departed Cadet Returned and Turned Back	
6E	Departed Cadet Returned and Stayed with Class	
6F	Reentry of Previously Resigned or Discharged Cadet	
6G	Foreign Exchange Student	

6H	USMA Exchange Student
6I	USNA Exchange Student
6J	USCG Exchange Student
6K	Departed on Stop-Out
6L	Suspended
7A	Graduated and Commissioned USAF
7B	Graduated-Deceased
7C	Graduated-Not Commissioned
7D	Graduated-Commissioned in Another Service.

Appendix E

SAS Regression Analysis Printouts

The following pages contain the printouts from SAS, the statistical package primarily used to analyze the data base. The information is presented in the following order:

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN
CODE=0						
GPA1	298	2.7886242	0.5532224	1.3100000	4.000000	0.03204731
MPA1	298	2.8893926	0.3497172	2.0380000	3.733000	0.02025857
YR	298	84.9295302	0.3647800	83.0000000	85.000000	0.02113114
COM1	298	5.1205201	0.7463852	1.8330000	6.417000	0.04323693
ANX1	298	1.8664430	0.4903254	1.0000000	3.100000	0.02840379
CUR1	298	3.0661074	0.5074120	1.7000000	4.000000	0.02939359
MAD1	298	1.8922819	0.4798016	1.0000000	3.800000	0.02779416
ZGPA1	298	3.3351633	0.8791889	0.9853128	5.260299	0.05093004
ZMPA1	298	5.0218694	0.9265807	2.7660927	7.257019	0.05367538
ZCOM1	298	4.4885315	0.9700750	0.2157498	6.173563	0.05619493
ZANX1	298	1.8035047	1.0206143	0.0000000	4.371159	0.05912260
ZCUR1	298	2.7160856	1.0088332	0.0000000	4.572845	0.05844014
ZMAD1	298	1.8696438	1.0053528	0.0000000	5.866983	0.05823852
DELANX	298	331.7433659	131.2222339	0.4880120	609.187500	7.60149991
DELCUR	298	322.6605605	123.2230184	-31.2559880	581.751500	7.13811780
DELMAD	298	331.3321578	130.6944463	-0.6279880	609.187500	7.57092599
CODE=1						
GPA1	42	2.1150000	0.8058180	0.6900000	3.690000	0.1243404
MPA1	42	2.5399762	0.4269280	0.9940000	3.628000	0.0658764
YR	42	82.9047619	0.7904776	82.0000000	85.000000	0.1219733
COM1	42	5.1348571	0.9268562	1.6670000	6.417000	0.1430170
ANX1	42	1.8285714	0.4068233	1.1000000	2.600000	0.0627742
CUR1	42	3.1880952	0.4618111	2.4000000	4.000000	0.0712590
MAD1	42	1.8404762	0.4617356	1.1000000	2.800000	0.0712474
ZGPA1	42	2.2646302	1.2806174	0.0000000	4.767643	0.1976036
ZMPA1	42	4.0960857	1.1311516	0.0000000	6.978820	0.1745405
ZCOM1	42	4.5071653	1.2046327	0.0000000	6.173563	0.1858789
ZANX1	42	1.7246749	0.8468045	0.2081504	3.330407	0.1306648
ZCUR1	42	2.9586210	0.9181697	1.3917353	4.572845	0.1416767
ZMAD1	42	1.7610927	0.9674982	0.2095351	3.771632	0.1492882
DELANX	42	343.4578990	146.4714504	-2.9160000	603.863500	22.6010355
DELCUR	42	330.4509466	146.2140286	-10.9760000	595.687500	22.5613144
DELMAD	42	342.7402800	147.2123761	-0.1080000	607.139500	22.7153628

TTEST PROCEDURE

VARIABLE: ZGPA1

CODE	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM
0	298	3.33516330	0.87918886	0.05093004	0.98531280	5.26029898
1	42	2.26463023	1.28061744	0.19760356	0.00000000	4.76764258

VARIANCES	T	DF	PROB > |T|
UNEQUAL	5.2461	46.6	0.0001
EQUAL	6.9312	338.0	0.0001

FOR HO: VARIANCES ARE EQUAL, F' = 2.12 WITH 41 AND 297 DF
PROB > F' = 0.0004

VARIABLE: ZMPA1

CODE	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM
0	298	5.02186940	0.92658066	0.05367538	2.76609268	7.25701903
1	42	4.09608566	1.13115165	0.17454049	0.00000000	6.97882005

VARIANCES	T	DF	PROB > |T|
UNEQUAL	5.0698	49.1	0.0001
EQUAL	5.8894	338.0	0.0001

FOR HO: VARIANCES ARE EQUAL, F' = 1.49 WITH 41 AND 297 DF
PROB > F' = 0.0664

VARIABLE: COM1

CODE	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM
0	298	5.12052013	0.74638520	0.04323693	1.83300000	6.41700000
1	42	5.13485714	0.92685623	0.14301702	1.66700000	6.41700000

VARIANCES	T	DF	PROB > |T|
UNEQUAL	-0.0960	48.8	0.9239
EQUAL	-0.1129	338.0	0.9102

FOR HO: VARIANCES ARE EQUAL, F' = 1.54 WITH 41 AND 297 DF
PROB > F' = 0.0460

TTEST PROCEDURE

VARIABLE: ANX1

CODE	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM
0	298	1.86644295	0.49032536	0.02840379	1.00000000	3.10000000
1	42	1.82857143	0.40682334	0.06277420	1.10000000	2.60000000

VARIANCES	T	DF	PROB > |T|
UNEQUAL	0.5496	59.2	0.5846
EQUAL	0.4777	338.0	0.6331

FOR HO: VARIANCES ARE EQUAL, F' = 1.45 WITH 297 AND 41 DF
PROB > F' = 0.1474

VARIABLE: CUR1

CODE	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM
0	298	3.06610738	0.50741201	0.02939359	1.70000000	4.00000000
1	42	3.18809524	0.46181106	0.07125839	2.40000000	4.00000000

VARIANCES	T	DF	PROB > |T|
UNEQUAL	-1.5825	55.9	0.1192
EQUAL	-1.4741	338.0	0.1414

FOR HO: VARIANCES ARE EQUAL, F' = 1.21 WITH 297 AND 41 DF
PROB > F' = 0.4716

VARIABLE: MAD1

CODE	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM
0	298	1.89228188	0.47980162	0.02779416	1.00000000	3.80000000
1	42	1.84047619	0.46173560	0.07124735	1.10000000	2.80000000

VARIANCES	T	DF	PROB > |T|
UNEQUAL	0.6774	54.3	0.5010
EQUAL	0.6581	338.0	0.5109

FOR HO: VARIANCES ARE EQUAL, F' = 1.08 WITH 297 AND 41 DF
PROB > F' = 0.7928

DATA CORRELATIONS

11:37 MONDAY, NOVEMBER 9, 1987

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
CODE	340	0.1235294	0.32952887	42.0000	0.0000000	1.0000000
GPA1	340	2.7054118	0.62924181	919.8400	0.6900000	4.0000000
MPA1	340	2.8462294	0.37742769	967.7180	0.9940000	3.7330000
COM1	340	5.1222912	0.76940983	1741.5790	1.6670000	6.4170000
ANX1	340	1.8617647	0.48042183	633.0000	1.0000000	3.1000000
CUR1	340	3.0811765	0.50296915	1047.6000	1.7000000	4.0000000
MAD1	340	1.8858824	0.47724701	641.2000	1.0000000	3.8000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 340

	CODE	GPA1	MPA1	COM1	ANX1	CUR1	MAD1
CODE	1.00000 0.0000	-0.35277 0.0001	-0.30507 0.0001	0.00614 0.9102	-0.02598 0.6331	0.07992 0.1414	-0.03577 0.5109
GPA1	-0.35277 0.0001	1.00000 0.0000	0.44877 0.0001	-0.06433 0.2368	0.02439 0.6541	0.03964 0.4663	0.03540 0.5153
MPA1	0.30507 0.0001	0.44877 0.0001	1.00000 0.0000	0.10482 0.0535	0.00869 0.8731	0.07164 0.1876	0.06750 0.2145
COM1	0.00614 0.9102	-0.06433 0.2368	0.10482 0.0535	1.00000 0.0000	-0.31855 0.0001	0.41232 0.0001	0.16912 0.0018
ANX1	-0.02598 0.6331	0.02439 0.6541	0.00869 0.8731	-0.31855 0.0001	1.00000 0.0000	-0.46713 0.0001	0.38901 0.0001
CUR1	0.07992 0.1414	0.03964 0.4663	0.07164 0.1876	0.41232 0.0001	-0.46713 0.0001	1.00000 0.0000	-0.15632 0.0039
MAD1	-0.03577 0.5109	0.03540 0.5153	-0.06750 0.2145	-0.16912 0.0018	0.38901 0.0001	-0.15632 0.0039	1.00000 0.0000

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
CODE	340	0.1235294	0.3295289	42.0000	0.0000000	1.0000000
ZGPA1	340	3.20292210	1.0000000	1088.9931	0.0000000	5.2602990
ZMPA1	340	4.90750079	1.0000000	1668.5527	0.0000000	7.2570190
COM1	340	5.1222912	0.7694098	1741.5790	1.6670000	6.4170000
ANX1	340	1.8617647	0.4804218	633.0000	1.0000000	3.1000000
CUR1	340	3.0811765	0.5029691	1047.6000	1.7000000	4.0000000
MAD1	340	1.8858824	0.4772470	641.2000	1.0000000	3.8000000

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER HO:RHO=0 / N = 340

	CODE	ZGPA1	ZMPA1	COM1	ANX1	CUR1	MAD1
CODE	1.00000 0.0000	-0.35277 0.0001	-0.30507 0.0001	0.00614 0.9102	-0.02598 0.6331	0.07992 0.1414	0.03577 0.5109
ZGPA1	0.35277 0.0001	1.00000 0.0000	0.44877 0.0001	0.06433 0.2368	0.02439 0.6541	0.03964 0.4663	-0.03540 0.5153
ZMPA1	-0.30507 0.0001	0.44877 0.0001	1.00000 0.0000	0.10482 0.0535	0.00869 0.8731	0.07164 0.1876	-0.06750 0.2145
COM1	0.00614 0.9102	0.06433 0.2368	0.10482 0.0535	1.00000 0.0000	-0.31855 0.0001	0.41232 0.0001	-0.16912 0.0018
ANX1	-0.02598 0.6331	0.02439 0.6541	0.00869 0.8731	-0.31855 0.0001	1.00000 0.0000	-0.46713 0.0001	0.38901 0.0001
CUR1	0.07992 0.1414	0.03964 0.4663	0.07164 0.1876	0.41232 0.0001	-0.46713 0.0001	1.00000 0.0000	-0.15632 0.0039
MAD1	0.03577 0.5109	-0.03540 0.5153	-0.06750 0.2145	-0.16912 0.0018	0.38901 0.0001	-0.15632 0.0039	1.00000 0.0000

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	4	5.43389015	1.35847254	14.50
ERROR	335	31.37787455	0.09366530	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.147613	247.7530	0.30604787	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ZGPA1	1	4.58114188	48.91	0.0001
COM1	1	0.01012935	0.11	0.7425
ANX1	1	0.02100370	0.22	0.6361
COM1*ANX1	1	0.82161522	8.77	0.0033

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ZGPA1	1	4.72758012	50.47	0.0001
COM1	1	0.83200244	8.88	0.0031
ANX1	1	0.84261825	9.00	0.0029
COM1*ANX1	1	0.82161522	8.77	0.0033

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.89262663	4.01	0.0001	0.47187901
ZGPA1	0.11842133	7.10	0.0001	0.01666863
COM1	-0.26272268	2.98	0.0031	0.08815047
ANX1	.69731646	3.00	0.0029	0.23248977
COM1*ANX1	.13315268	2.96	0.0033	0.04495780

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.42064661
ZGPA1	1.00000000	0.99444160
COM1	0.99586153	0.06006401
ANX1	0.89851103	0.02214756
COM1*ANX1	0.02277157	0.02277757

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	4	5.58347008	1.39586752	14.97
ERROR	335	31.22829462	0.09321879	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.151676	247.1618	0.30531752	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ZGPA1	1	4.58114188	49.14	0.0001
COM1	1	0.01012935	0.11	0.7419
CUR1	1	0.45305435	4.86	0.0282
COM1*CUR1	1	0.53914451	5.78	0.0167

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ZGPA1	1	4.89680811	52.53	0.0001
COM1	1	0.42751263	4.59	0.0330
CUR1	1	0.70137190	7.52	0.0064
COM1*CUR1	1	0.53914451	5.78	0.0167

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.13132083	1.73	0.0849	0.65468838
ZGPA1	-0.12084980	-7.25	0.0001	0.01667405
COM1	0.27786060	2.14	0.0330	0.12974906
CUR1	0.58877598	2.74	0.0064	0.21464839
COM1*CUR1	-.10008189	-2.40	0.0167	0.04161545

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.21748744
ZGPA1	1.00000000	0.98905742
COM1	0.99586153	0.02759179
CUR1	0.82559888	0.02359206
COM1*CUR1	0.00921373	0.00921373

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	4	5.01678475	1.25419619	13.21
ERROR	335	31.79497996	0.09491039	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.136282	249.3943	0.30807530	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ZGPA1	1	4.58114188	48.27	0.0001
COM1	1	0.01012935	0.11	0.7441
MAD1	1	0.02574268	0.27	0.6029
COM1*MAD1	1	0.39977084	4.21	0.0409

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ZGPA1	1	4.80273191	50.60	0.0001
COM1	1	0.41403568	4.36	0.0375
MAD1	1	0.42179581	4.44	0.0358
COM1*MAD1	1	0.39977084	4.21	0.0409

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.45907634	3.20	0.0015	0.45612486
ZGPA1	-0.11994953	-7.11	0.0001	0.01686208
COM1	-0.17996341	-2.09	0.0375	0.08616328
MAD1	-0.18620279	-2.11	0.0358	0.23063393
COM1*MAD1	0.09245436	2.05	0.0409	0.04504833

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.45619053
ZGPA1	1.00000000	0.98467192
COM1	0.99586153	0.66370216
MAD1	0.97079570	0.02310900
COM1*MAD1	0.02020325	0.02020325

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	4	3.98217143	0.99554286	10.16
ERROR	335	32.82959328	0.09799879	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.108177	253.4195	0.31304758	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ZMPA1	1	3.42604203	34.96	0.0001
COM1	1	0.05408324	0.55	0.4581
ANX1	1	0.00497780	0.05	0.8218
COM1*ANX1	1	0.49706836	5.07	0.0250

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ZMPA1	1	3.27586140	33.43	0.0001
COM1	1	0.39642941	4.05	0.0451
ANX1	1	0.50037271	5.11	0.0245
COM1*ANX1	1	0.49706836	5.07	0.0250

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.56726511	3.28	0.0011	0.47777095
ZMPA1	-0.09915842	-5.78	0.0001	0.01715052
COM1	-0.18189037	-2.01	0.0451	0.09043512
ANX1	0.53838412	2.26	0.0245	0.23826255
COM1*ANX1	0.10371747	2.25	0.0250	0.04605260

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.42932009
ZMPA1	1.00000000	0.98280338
COM1	0.98901228	0.05970783
ANX1	0.89673548	0.02206297
COM1*ANX1	0.02271177	0.02271177

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	4	4.10955423	1.02738856	10.52
ERROR	335	32.70221047	0.09761854	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.111637	252.9273	0.31243966	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ZMPA1	1	3.42604203	35.10	0.0001
COM1	1	0.05408324	0.55	0.4572
CUR1	1	0.32968248	3.38	0.0670
COM1*CUR1	1	0.29974648	3.07	0.0806

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ZMPA1	1	3.42289226	35.06	0.0001
COM1	1	0.28540516	2.92	0.0882
CUR1	1	0.40514667	4.15	0.0424
COM1*CUR1	1	0.29974648	3.07	0.0806

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	-0.73121895	-1.08	0.2812	0.67745042
ZMPA1	-0.10123646	-5.92	0.0001	0.01709647
COM1	0.22713422	1.71	0.0882	0.13283662
CUR1	0.44741401	2.04	0.0424	0.21961884
COM1*CUR1	-0.07467437	-1.75	0.0806	0.04261482

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.21270479
ZMPA1	1.00000000	0.98518923
COM1	0.98901228	0.02756649
CUR1	0.82917799	0.02359993
COM1*CUR1	0.00920137	0.00920137

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	4	3.80771179	0.95192795	9.66
ERROR	335	33.00405292	0.09851956	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.103437	254.0919	0.31387826	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ZMPA1	1	3.42604203	34.78	0.0001
COM1	1	0.05408324	0.55	0.4593
MAD1	1	0.09542689	0.97	0.3257
COM1*MAD1	1	0.23215963	2.36	0.1257

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ZMPA1	1	3.59365895	36.48	0.0001
COM1	1	0.17560394	1.78	0.1828
MAD1	1	0.27446291	2.79	0.0960
COM1*MAD1	1	0.23215963	2.36	0.1257

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.29279339	2.80	0.0055	0.46232274
ZMPA1	-0.10374218	-6.04	0.0001	0.01717703
COM1	-0.11643715	-1.34	0.1828	0.08721389
MAD1	-0.39072971	-1.67	0.0960	0.23409700
COM1*MAD1	0.07013318	1.54	0.1257	0.04568687

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.46092680
ZMPA1	1.00000000	0.98497781
COM1	0.98901228	0.06454104
MAD1	0.96889507	0.02328331
COM1*MAD1	0.02038941	0.02038941

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	7.19516499	1.43903300	16.23
ERROR	334	29.61659972	0.08867245	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.195458	241.0594	0.29777920	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ANX1	1	0.02484012	0.28	0.5970
COM1	1	0.00018666	0.00	0.9634
ANX1*ZGPA1	1	3.85603145	43.49	0.0001
ZGPA1*ZGPA1	1	0.41009263	4.62	0.0322
ZGPA1*ZGPA1*ZGPA1	1	2.90401414	32.75	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ANX1	1	0.00215994	0.02	0.8761
COM1	1	0.02602753	0.29	0.5883
ANX1*ZGPA1	1	0.00197297	0.02	0.8815
ZGPA1*ZGPA1	1	2.10188173	23.70	0.0001
ZGPA1*ZGPA1*ZGPA1	1	2.90401414	32.75	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.74531843	3.37	0.0008	0.22125465
ANX1	-0.01761954	-0.16	0.8761	0.11289316
COM1	-0.01204681	-0.54	0.5883	0.02220565
ANX1*ZGPA1	0.00499843	0.15	0.8815	0.03350944
ZGPA1*ZGPA1	-0.13627893	-4.87	0.0001	0.02799103
ZGPA1*ZGPA1*ZGPA1	0.02317173	5.72	0.0001	0.00404905

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	1.81135640
ANX1	1.00000000	0.08892181
COM1	0.89852627	0.89366363
ANX1*ZGPA1	0.58358288	0.03863018
ZGPA1*ZGPA1	0.10414116	0.00851825
DUMMY001	0.01470953	0.01470953

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	7.98588074	1.59717615	18.51
ERROR	334	28.82588396	0.08630504	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V	ROOT MSE	CODE MEAN
0.216938	237.8196	0.29377720	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
CUR1	1	0.23513868	2.72	0.0998
COM1	1	0.03188625	0.37	0.5437
CUR1*ZGPA1	1	4.65862431	53.98	0.0001
ZGPA1*ZGPA1	1	2.07785283	24.08	0.0001
ZGPA1*ZGPA1*ZGPA1	1	0.98237867	11.38	0.0008

SOURCE	DF	TYPE III SS	F VALUE	PR > F
CUR1	1	0.74700248	8.66	0.0035
COM1	1	0.14299739	1.66	0.1989
CUR1*ZGPA1	1	0.51761048	6.00	0.0148
ZGPA1*ZGPA1	1	0.27869287	3.23	0.0732
ZGPA1*ZGPA1*ZGPA1	1	0.98237867	11.38	0.0008

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.12956464	0.54	0.5917	0.24133961
CUR1	0.27312791	2.94	0.0035	0.09283744
COM1	-0.02943277	-1.29	0.1989	0.02286573
CUR1*ZGPA1	-0.06545351	-2.45	0.0148	0.02672695
ZGPA1*ZGPA1	-0.06023376	-1.80	0.0732	0.03351932
ZGPA1*ZGPA1*ZGPA1	0.01490716	3.37	0.0008	0.00441849

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	1.48176369
CUR1	1.00000000	0.11676360
COM1	0.82999444	0.82252812
CUR1*ZGPA1	0.76109660	0.02711928
ZGPA1*ZGPA1	0.06804022	0.00578156
DUMMY001	0.01202282	0.01202282

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	7.56375445	1.51275089	17.27
ERROR	334	29.24801025	0.08756889	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.205471	239.5546	0.29592042	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
MAD1	1	0.04710229	0.54	0.4638
COM1	1	0.00000031	0.00	0.9985
MAD1*ZGPA1	1	4.46571245	51.00	0.0001
ZGPA1*ZGPA1	1	1.45580540	16.62	0.0001
ZGPA1*ZGPA1*ZGPA1	1	1.59513400	18.22	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
MAD1	1	0.33342237	3.81	0.0519
COM1	1	0.00887117	0.10	0.7505
MAD1*ZGPA1	1	0.37038681	4.23	0.0405
ZGPA1*ZGPA1	1	0.73318487	8.37	0.0041
ZGPA1*ZGPA1*ZGPA1	1	1.59513400	18.22	0.0001

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.37696586	1.67	0.0950	0.22514407
MAD1	0.23278967	1.95	0.0519	0.11930023
COM1	-0.00680520	-0.32	0.7505	0.02138086
MAD1*ZGPA1	-0.07408849	-2.06	0.0405	0.03602450
ZGPA1*ZGPA1	-0.08417736	2.89	0.0041	0.02909132
ZGPA1*ZGPA1*ZGPA1	0.01752280	4.27	0.0001	0.00410563

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	1.72753828
MAD1	1.00000000	0.07968585
COM1	0.97139953	0.95451872
MAD1*ZGPA1	0.58889565	0.03299501
ZGPA1*ZGPA1	0.09158984	0.00778793
DUMMY001	0.01412888	0.01412888

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	4.45577548	0.89115510	9.20
ERROR	334	32.35598923	0.09687422	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.121042	251.9612	0.31124624	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
ANX1	1	0.02484012	0.26	0.6129
COM1	1	0.00018666	0.00	0.9650
ANX1*ZMPA1	1	3.01274346	31.10	0.0001
ZMPA1*ZMPA1	1	0.00327058	0.03	0.8543
ZMPA1*ZMPA1*ZMPA1	1	1.41473466	14.60	0.0002

SOURCE	DF	TYPE III SS	F VALUE	PR > F
ANX1	1	0.08810205	0.91	0.3410
COM1	1	0.03045134	0.31	0.5754
ANX1*ZMPA1	1	0.08709424	0.90	0.3437
ZMPA1*ZMPA1	1	1.35687873	14.01	0.0002
ZMPA1*ZMPA1*ZMPA1	1	1.41473466	14.60	0.0002

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.01598401	3.23	0.0014	0.31441805
ANX1	-0.17314606	-0.95	0.3410	0.18156148
COM1	0.01314960	0.56	0.5754	0.02345381
ANX1*ZMPA1	0.03450630	0.95	0.3437	0.03639216
ZMPA1*ZMPA1	-0.08673203	-3.74	0.0002	0.02317464
ZMPA1*ZMPA1*ZMPA1	0.00921951	3.82	0.0002	0.00241254

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.97992602
ANX1	1.00000000	0.03755914
COM1	0.89852627	0.87753884
ANX1*ZMPA1	0.38483082	0.02323048
ZMPA1*ZMPA1	0.08779243	0.00568021
DUMMY001	0.00876847	0.00876847

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	4.68788600	0.93757720	9.75
ERROR	334	32.12387870	0.09617928	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.127347	251.0559	0.31012784	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
CUR1	1	0.23513868	2.44	0.1189
COM1	1	0.03188625	0.33	0.5651
CUR1*ZMPA1	1	3.36999513	35.04	0.0001
ZMPA1*ZMPA1	1	0.27824836	2.89	0.0899
ZMPA1*ZMPA1*ZMPA1	1	0.77261758	8.03	0.0049

SOURCE	DF	TYPE III SS	F VALUE	PR > F
CUR1	1	0.09391342	0.98	0.3238
COM1	1	0.00433844	0.05	0.8319
CUR1*ZMPA1	1	0.03949566	0.41	0.5221
ZMPA1*ZMPA1	1	0.42627571	4.43	0.0360
ZMPA1*ZMPA1*ZMPA1	1	0.77261758	8.03	0.0049

PARAMETER	ESTIMATE	T FOR HO: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	0.43078985	1.07	0.2869	0.40383206
CUR1	0.17178669	0.99	0.3238	0.17384670
COM1	-0.00513725	-0.21	0.8319	0.02418824
CUR1*ZMPA1	-0.02160641	0.64	0.5221	0.03371698
ZMPA1*ZMPA1	-0.05580946	-2.11	0.0360	0.02650961
ZMPA1*ZMPA1*ZMPA1	0.00691577	2.83	0.0049	0.00244005

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.58976627
CUR1	1.00000000	0.03710788
COM1	0.82999444	0.81913917
CUR1*ZMPA1	0.56072539	0.01449479
ZMPA1*ZMPA1	0.03879159	0.00430980
DUMMY001	0.00851037	0.00851037

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: CODE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	4.71909205	0.94381841	9.82
ERROR	334	32.09267265	0.09608585	PR > F
CORRECTED TOTAL	339	36.81176471		0.0001

R-SQUARE	C.V.	ROOT MSE	CODE MEAN
0.128195	250.9339	0.30997717	0.12352941

SOURCE	DF	TYPE I SS	F VALUE	PR > F
MAD1	1	0.04710229	0.49	0.4849
COM1	1	0.00000031	0.00	0.9986
MAD1*ZMPA1	1	2.93868175	30.58	0.0001
ZMPA1*ZMPA1	1	0.03339935	0.35	0.5559
ZMPA1*ZMPA1*ZMPA1	1	1.69990835	17.69	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
MAD1	1	0.33951816	3.53	0.0610
COM1	1	0.01393888	0.15	0.7035
MAD1*ZMPA1	1	0.30671589	3.19	0.0749
ZMPA1*ZMPA1	1	1.70930090	17.79	0.0001
ZMPA1*ZMPA1*ZMPA1	1	1.69990835	17.69	0.0001

PARAMETER	ESTIMATE	T FOR H0: PARAMETER=0	PR > |T|	STD ERROR OF ESTIMATE
INTERCEPT	1.33592537	3.91	0.0001	0.34146820
MAD1	-0.38306363	-1.88	0.0610	0.20378355
COM1	0.00851563	0.08	0.7035	0.02235798
MAD1*ZMPA1	0.07342343	1.79	0.0749	0.04109568
ZMPA1*ZMPA1	-0.10393392	-4.22	0.0001	0.02464210
ZMPA1*ZMPA1*ZMPA1	0.01052825	4.21	0.0001	0.00250307

GENERAL LINEAR MODELS PROCEDURE

TOLERANCES

DEPENDENT VARIABLE: CODE

VARIABLE	TYPE I TOLERANCE	TYPE II TOLERANCE
INTERCEPT	340.00000000	0.82406011
MAD1	1.00000000	0.02996643
COM1	0.97139953	0.95780918
MAD1*ZMPA1	0.40992635	0.02019395
ZMPA1*ZMPA1	0.07699521	0.00498294
DUMMY001	0.00807938	0.00807938

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Vita

Captain Nathaniel [redacted] He graduated from George Washington Carver High School in 1977 and attended the University of Alabama where he received the degree of Bachelor of Science in Mathematics and Psychology in May 1981. He received his commission as a second Lieutenant upon graduation, through the Reserved Officer Training Corp program. He was assigned to the Foreign Technology Division Headquarters as an Space Systems Powered Flight Trajectory analyst from October 1981 to May 1985. He was reassigned to the Air Force Institute of Technology (AFIT) in May of 1985 to work on his Masters Degree in Operations Research. He also received his Masters of Divinity Degree from United Theological Seminary in May of 1985. He was promoted to Captain and appointed a regular officer in July of 1985. In March of 1987, he received his certification through AFIT in Reliability an Maintainability Engineering. He is presently assigned as a Vulnerability analyst with the Directorate of Engineering, Armament Division Headquarters, Eglin AFB, Florida.

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Block 19

Abstract

This thesis determined the effects of an individual's trait anxiety and level of organizational commitment on attrition at the United States Air Force Academy. The subjects of this study were entering cadets to the Academy's Class of 1986. The major areas of concern in this study were the applicability of the cusp catastrophe model in modeling behavioral attributes and the usefulness of the trait variables in explaining attrition. The study concluded that the cusp model could be useful in modeling attrition and that trait curiosity was better than trait anxiety in predicting attrition.

The data base consisted of results from the surveys given to the cadets during their first two years of attendance at the Academy, and of their actual military and academic performance scores. The analysis was accomplished by cusp regression analysis, multiple regression analysis, ANOVA, analysis of the coefficients of determination, and correlational analysis. The results indicated that all of the regression models were significant and that organizational commitment was not a significant parameter in any of the models.